Farm Chemicals

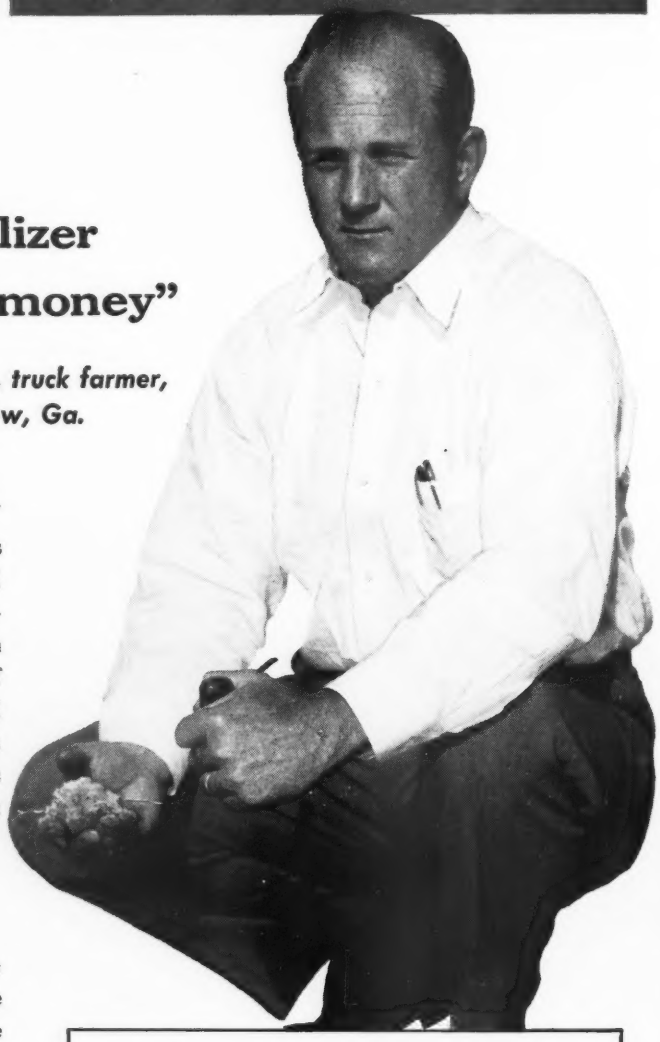
Pioneer Journal
of the Industry

Vol. 119 No. 12 DECEMBER 1956 50 Cents

HOW UNION MULTIWALLS BUILD MORE BUSINESS FOR THE FERTILIZER INDUSTRY

"Now I know... cutting down on fertilizer actually costs me money"

John Patrick, truck farmer, Marlow, Ga.



"I've known about fertilizer for a long time," says John Patrick, who with his brother Carl runs a 100-acre truck farm near Marlow, Ga., "but I didn't realize that every *dollar* invested in fertilizer can bring a farmer a *four dollar* return in crop value! That's how the U. S. Department of Agriculture figures it. Like a lot of farmers, I'd tried to *save* money by cutting down on fertilizer, but actually I was *losing* money, as I got lower yields on my crops. Now I know fertilizer is my best investment."

Union's information program increases fertilizer use

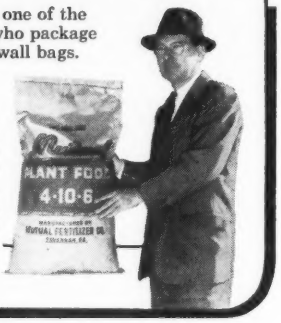
Mr. Patrick discovered his "profit formula" in one of the farm magazines he reads. The article was one of many prepared by Union as part of a countrywide newspaper-radio-television educational campaign to help farmers use more scientific methods.

One of the main purposes of this program is to show your customers how to make the best use of fertilizer. As one of the major manufacturers of Multiwall paper sacks for fertilizer, Union is happy to make this contribution to the industry.

Mutual Fertilizer Company is one of the many leading manufacturers who package their products in Union Multiwall bags.

Mr. Charles Ellis Jr., President, Mutual Fertilizer Company, Savannah, Ga.

"I believe Union's information program on the scientific use of fertilizer will help the farmers. Union does as well with its Multiwalls as it does with its fertilizer program. We use Union Multiwalls. They're among the best."



UNION Multiwall Bags

union camp

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Farm Chemicals

DECEMBER, 1956
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Vol. 119

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INDUSTRY NEWS

FEATURES

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In this issue . . .

Roy L. Donahue has written an article covering the world fertilizer situation. In his presentation, coverage is broken down by continents where trends and production figures are given in graphic form. The author states that world fertilizer production is increasing six per cent per year and nearly doubling every fifteen years. This informative article begins on page 40.

Starting on page 44 is an article which we feel provides data needed to fully appreciate the Canadian market in farm chemicals as it exists today. Written by D. K. Jackson, market research manager, Monsanto Chemical, Ltd., the article should be particularly helpful for those readers engaged in selling to the Canadian market now, or to those who contemplate entering this growing market of the future.

A report on Proceedings of the Middle West Soil Improvement Committee meeting recently held in Chicago starts on page 48. A summary of the speech by assistant secretary of agriculture, Earl L. Butz, on "Your Balance In The Soil Bank" is given.

An article based on studies which were initiated in 1947-48 for the improvement and development of equipment for insecticide application appears on page 50. Written by two USDA workers, the information gives some background on proper farm chemical applications.

Cover story

Our cover photo this month illustrates a "flying boxcar" spraying malathion for the control of Mediterranean fruit fly. In the Florida campaign to eradicate this menace some 210,000 acres are being treated by aerial application.

LINK-BELT "turn-key" SERVICE

unlocks new efficiencies in fertilizer production

Up goes steel work and Link-Belt equipment for another fertilizer plant handled on a "turn-key" contract. This TVA continuous ammoniator process will utilize anhydrous ammonia and ammonium nitrate solutions.

Under this inclusive 5-point program, LINK-BELT will:

1. **PILOT THE PROCESS,** using our complete laboratory and test facilities.
2. **DESIGN THE SYSTEM** as an efficient, integrated operation conforming to your exact needs.
3. **FABRICATE THE EQUIPMENT.** Link-Belt makes a complete line—will also supply special requirements.
4. **ERECT THE PLANT,** providing crews and supervisory service.
5. **START THE OPERATION,** with field engineers ready to make final adjustments.

FREEDOM from construction detail . . . integrated operation . . . a uniform product—Link-Belt "turn-key" service offers these and more benefits for fertilizer plants. Our specialists stand ready to cooperate with your engineers or consultants to produce a top-grade fertilizer at minimum cost.

Link-Belt experience includes dry-mix, superphosphate, ammonium phosphate, ammonium nitrate, ammonium sulphate, urea, granular and other types of fertilizer. If you're planning a new operation or feel your present system should be modernized, you'll want full details. Write for Book 2459 showing equipment and typical layouts . . . or call your nearest Link-Belt office.

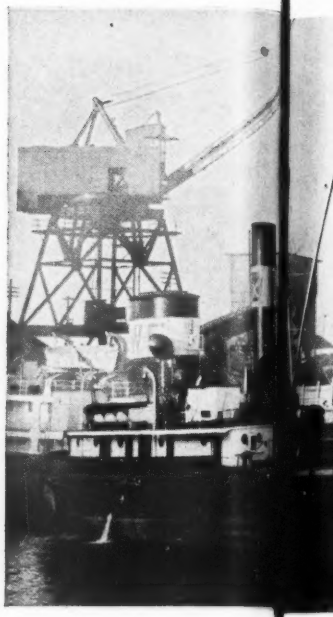
LINK-BELT

PLANTS AND EQUIPMENT FOR THE FERTILIZER INDUSTRY

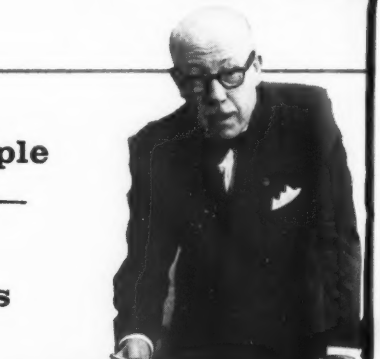
LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14.146

When it's loaded with International's T

"We like to see our ship come in!"



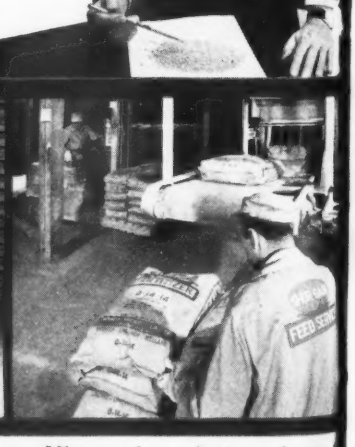
Mr. Alex Mooney,
General Sales Manager, Fertilizer Division
Canada Packers, Ltd., Toronto, Canada



Boat shipments of International's Triple arrive in excellent physical condition— just right for easy, quick unloading and for excellent ammoniation results

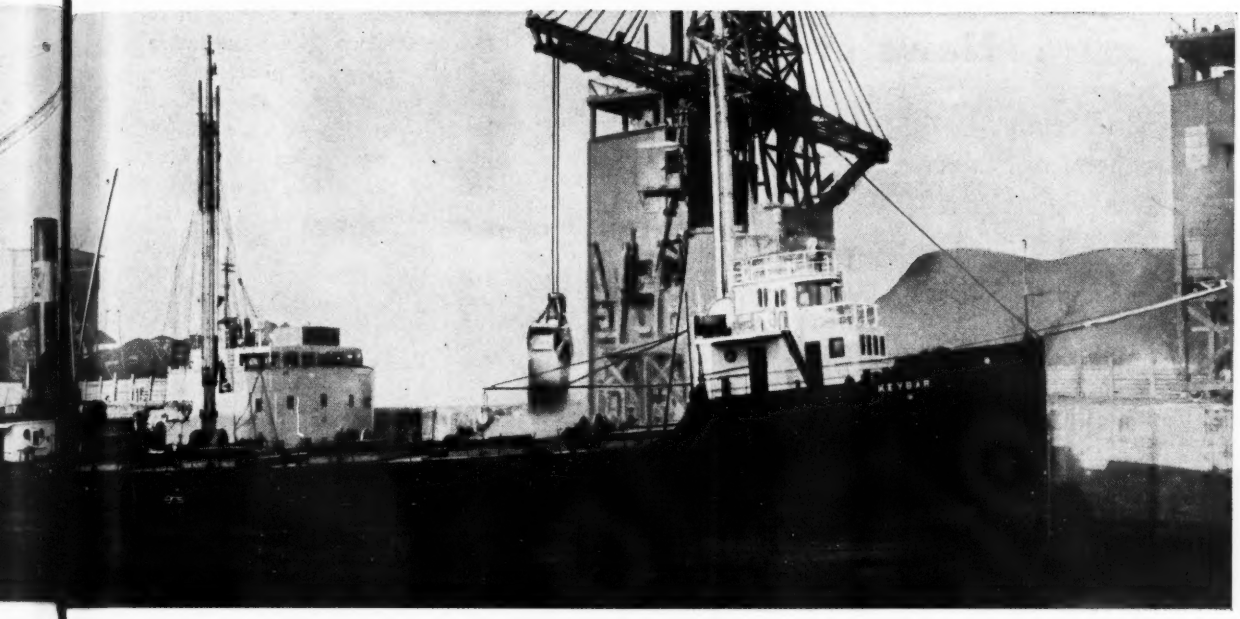
Water shipments mean immediate savings in shipping costs. International's Triple is loaded into ocean-going vessels at Tampa, Florida.

Even after a long, rugged trip, International's Triple unloads easily . . . cutting Canada Packers' handling costs to a minimum.



Nine modern plants make up t Fertilizer Division of the Can Packers organization. Mixed go are sold in Canada and the sta

Triple Superphosphate . . .



"Our first shipment of triple docked more than a year ago. It worked out fine . . . so have the rest," says Alex Mooney, general sales manager of Canada Packers' Fertilizer Division. "We're sold on ocean and lake-going vessel shipments, and particularly on the way International's Triple comes through in such fine physical condition."

This alert Canadian firm, headquartered in Toronto, was quick to take advantage of the savings offered by International's water shipments.

"We realize immediate savings in shipping costs. And excellent physical condition of International's Triple helps us hold down labor costs for handling. The moment the hatches are opened you can see that labor for unloading will be cut to a minimum."

These water shipments are a real test for the shipping and handling qualities of International's Triple. It is subjected to the rugged shipping conditions of ocean, river and Great Lakes travel.

When it reaches its final destination—the 9 Canada Packers plants — the triple goes into approximately 10 different high-analysis fertilizer formulas. Here again International's Triple gives further proof of its superior quality.

"In shipment after shipment we have been very happy with the ammoniation quality," adds Mooney. "It's the excellent physical and chemical condition of International's Triple that gives us such results."

Canada Packers is typical of a constantly growing number of firms who have tried International's Triple and have been satisfied.

The reason: Exclusive Bonnie processing produces a triple with built-in extras that help them cut costs. Uniform, fine texture means superior handling qualities. Natural curing for a minimum of 5 weeks gives them better control of manufacturing conditions . . . helps simplify formulation problems.

These users get the extra benefits of a guaranteed constant minimum of 46% APA. What's more, they're sold on International's friendly cooperation; fast, efficient shipping; and a modern warehousing program for off-season storage.

If you are not already using International's Triple, you owe it to yourself to put us to the test. You too will be satisfied.

Write or wire International Minerals & Chemical Corporation for full information on prices, shipping and warehousing arrangements.

MINERALS International CHEMICALS

PHOSPHATE CHEMICALS DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

General Offices: 20 North Wacker Drive, Chicago 6

Business & Management

. . . News of the Industry

CSC, CGS to Study Petrochemical Project

Commercial Solvents Corp. and Columbia Gas System will proceed with engineering and economic studies of a proposed joint project to produce petrochemicals, the two firms report.

The $40 to $50 million project, which would be located in the Ohio Valley area, has been under investigation during recent months by the two firms. Tentative plans call for startup of construction in early 1957 after necessary regulatory authorizations have been obtained.

Long range plans provide for formation of a jointly owned company and recognize the possibility that the new firm may ultimately be engaged in the entire field of ethylene and other hydrocarbon derivatives.

Coastal Chemical Contract to Fluor

Contract for the erection of phosphoric acid and granulating units of Coastal Chemical Corp.'s multi-million dollar farmer owned fertilizer plant at Pascagoula, Miss., has been awarded to the Fluor Corp., according to an announcement by C. S. Whittington, president of the firm. Actual construction is scheduled to begin soon after the first of the year.

Citizens of Jackson county, Miss., recently approved a $750,000 BAWI bond issue, making the funds available for use in development of the project, and the county's Port Authority has awarded a contract for dredging the deep water channel on which Coastal will locate.

According to terms of the contract with Fluor, the plant will be in operation by January 1, 1958. The first fertilizer will be allocated to stockholders of record on January 1, 1957.

Acid Concentrator Being Built at Lion

Construction has begun on a nitric acid concentrator at the El Dorado chemical plant of Lion Oil Co., a division of Monsanto Chemical Co., according to T. M. Martin, Lion Oil president.

The addition will concentrate 58 per cent nitric acid now being manufactured at two existing units. Under normal operation, it is expected to produce 40 tons per day of 95 per cent nitric acid, which will be used primarily as raw material by another Monsanto plant. Included in the construction will be blending facilities to produce 68 per cent nitric acid.

Construction contractor and designer of the installation, which is expected to be completed in March, 1957, is Chemical and Industrial Construction Co.

Anaconda to Make Amm. Phosphate

Anaconda Co. will expand its facilities at a cost of $1 million to produce ammonium phosphate fertilizer, according to a recent announcement.

The firm has signed a contract with U. S. Steel Corp. to buy anhydrous ammonia from the USS $18 million coal chemical plant now being built near Provo, Utah, for use in manufacturing the ammonium phosphate.

Miller Buys Ephrata Plant of LBF Co.

Lancaster Bone Fertilizer Co.'s plant at Ephrata, Pa., has been acquired by Miller Chemical & Fertilizer Corp. The Baltimore concern reports it plans to enlarge and modernize the present facilities at Ephrata to better serve its growing business in this area. A sales office is being established at the plant.

In addition, Miller recently established a warehouse for pesticides at the new P. L. Rohrer & Bro. Co. warehouse at Smoketown, Pa. Sales from both points will be directed by O. Neuman, Jr., Miller vice president, assisted by Theodore N. Minnich of Lancaster, Pa., formerly with Lancaster Bone Fertilizer Co., and Elwood K. Funk, Leola, Pa., a Miller employee.

New Containers For Crag Glyodin

Crag Glyodin fungicide now is being shipped to fruit growers in new white, green and red lithographed drums by Carbide & Carbon Chemicals Co., a division of Union Carbide & Carbon Corp.

Because the high cost of pasting on a paper label is eliminated, C & C says the containers cost no more than ordinary drums. Main advantage is that the label can't come off.

You save money with LION in your fields

LION BRAND AMMONIUM NITRATE IS A LOW-COST SOLID NITROGEN FERTILIZER

FOR LOW-COST NITROGEN, LION is the brand. Lion Ammonium Nitrate is guaranteed to contain 33.5% nitrogen, which means lower-cost nitrogen for your crops . . . more for your money in bigger crop yields.

FOR MORE PRODUCTION, Lion Ammonium Nitrate contains TWO kinds of plant nitrogen. *Quick-acting* nitrate nitrogen that gets crops started fast . . . and *long-lasting* ammonia nitrogen that resists leaching and feeds your crops steadily during the important growing months that follow.

FOR EASIER SPREADING, Lion Ammonium Nitrate is in pellet form. These pellets are specially coated to withstand caking . . . then packed in specially lined, moisture-resistant bags. Here's double assurance Lion brand will flow freely, spread evenly after shipment or storage.

MADE BY WORLD'S LARGEST. Lion Brand Ammonium Nitrate is made by Monsanto Chemical Company, world's largest producer of prilled ammonium nitrate—and *your* most reliable source of *low-cost* nitrogen. Save money. Buy *Lion!*

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All kinds of processing and manufacturing plants are reporting exceptional satisfaction with the performance of the new-model HA "PAYLOADER" tractor-shovels. With their larger 18 cu. ft. buckets, they not only handle more tonnage of bulk materials than earlier models, but are way ahead of other front-end loaders in design and productivity — can deliver more tons per hour than heavier machines with larger engines.

Exclusive one-lever control handles tip-back, lift, dump and lowering of the bucket, simplifying and speeding operating cycles. The 40 degree tip-back of the bucket at ground level gets and holds big loads close and low without spilling. Hydraulic load-shock-absorber smooths the ride and permits higher travel speeds.

Fast, efficient and low-cost boxcar loading and unloading

Lift-fork attachment for pallet loads

Push-fork attachment for spotting cars, skidding machinery, etc.

Pick-up sweeper to clean floors, aisles, docks, and driveways

Special tine-buckets for odd pieces and "sifting" work

Barrels, carboys, bales, bags, drums also handled with bucket

Truck loading and unloading tool Here shown unloading metal chips.

. . . More Versatile

Greater productivity is only half the story of the model HA, since it can be readily adapted to do many other jobs on either a part-time or full-time basis. Quickly-attached floor sweeper, fork-lift and pusher-fork attachments, plus special buckets are available to further increase its usefulness and make this "PAYLOADER" one of the most versatile, profitable machines any plant can own.

• • • • •

The knowledge and experience gained during the past 30 years in building thousands of tractor-shovels — more wheeled tractor-shovels than all others combined — is your assurance of superior design, engineering and performance. The "PAYLOADER" line is also a complete line — a size for every purpose — bucket capacities from 14 cu. ft. to 2¼ cu. yd. There is also a nearby "PAYLOADER" Distributor with complete parts and service facilities.

SAY "HUFF"

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Name

Title

Company

Street

City

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8

Profits in the First 9 Months of 56

Am. Pot. & Chemical

Sales and earnings of American Potash & Chemical Co. for the first nine months of 1956 were higher than in the comparable period a year ago, said President Peter Colefax in a recent report to shareholders.

For the nine months ended Sept. 30, net sales totaled $31,-119, 553, an increase of $10,844,-833 over sales reported for the corresponding months of 1955. Net income amounted to $3,684,-188, against $2,852,427 for the same period of 1955.

Atlas Power

A 26 per cent gain in net earnings for the first nine months of 1956 over the same period in 1955 is reported by Atlas Powder Co. Amounting to $3,294,608, earnings were $4.40 a common share, compared with $2,616,193 or $3.43 a common share for the first nine months last year.

Sales and operating revenues from explosives and chemicals totaled $49,999,496 in the first three quarters of this year. This was an 8 per cent rise over the $46,397,974 reported in the same period of 1955.

Commercial Solvents

Commercial Solvents Corp. consolidated net earnings for the nine month period were $2,007,-862, equal to $.76 per share, compared with $.79 the previous year which included $.12 nonrecurring income. Sales for the period increased 8 per cent, reaching $41,315,356.

Diamond Alkali

Sales and earnings of Diamond Alkali Co. for the first nine months of 1956 reached new all-time levels, reports Raymond F. Evans, chairman and chief executive officer.

Net sales were $92,040,457 compared with $83,115,419 a year ago, an increase of 11 per cent. Net income amounted to $8,032,-702 against $6,255,846 for the same period of 1955.

Int. Min. & Chem.

International Minerals & Chemical Corp.'s net sales for the first quarter of the current fiscal year were up 15.6 per cent over the same period of the preceding fiscal year.

Earnings for the same period, reported IMC President Louis Ware, were $614,000 which compares with a loss of $860,000 experienced in the first three months of last year, largely as a consequence of the prolonged industry-wide strike of the Florida phosphate fields. He said that net earnings for the nine calendar months through Sept. 30, 1956, were $2,104,000 above last year and $1,173,000 above the same period in 1954 when there was no strike.

Pgh. Plate Glass

Sales of Pittsburgh Plate Glass Co. for the first nine months of 1956 increased 2 per cent above those for the same period of 1955 to $438,576,634. A 6 per cent decrease was recorded for net earnings during the nine-month period, which totaled $42,793,551, compared with $45,377,010 for the first nine months of 1955.

David G. Hill, president, said that chemical facilities operated by Columbia-Southern Chemical Corp., a wholly owned subsidiary, continued at near capacity operations through the third quarter.

Pgh. Coke & Chem.

Pittsburgh Coke & Chemical Co. net sales and earnings for the nine-month period ended Sept. 30, 1956, were about 10 per cent ahead of comparable figures for 1955's first nine months.

Sales reached $49,383,000 and earnings were $2,667,000, equal to $2.06 per share on the 1,129,401 shares currently outstanding.

Stauffer Chemical

Stauffer Chemical Co.'s unaudited earnings statement shows increases in both sales and earnings for the nine months ended Sept. 30, compared with the same period last year.

This year, the firm reports $119,419,839 sales, against $109,-143,867 last year, and earnings of $9,651,892, compared with $9,468,029 for the like period of 1955.

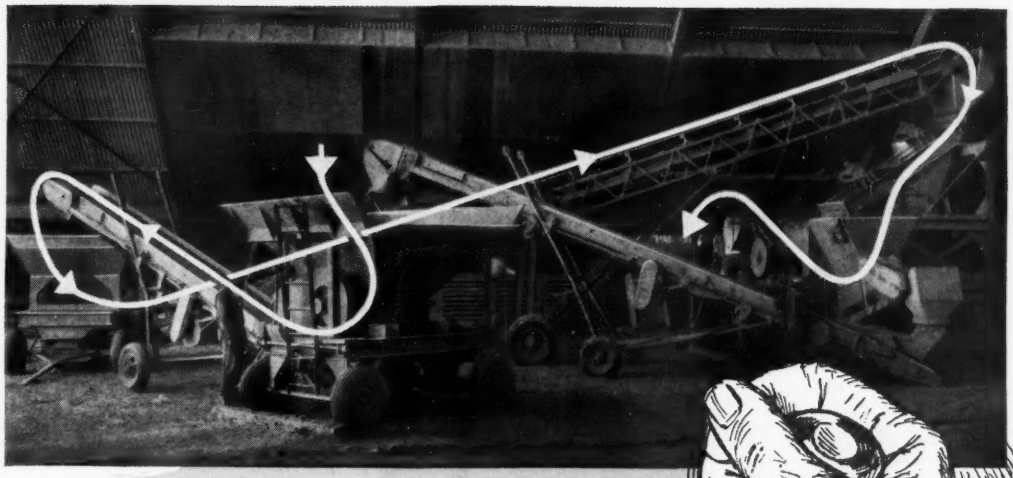
The Texas Co.

Estimated net income of The Texas Co. and subsidiaries for the nine month period amounted to $207,429,225 or $3.78 a share, compared with $189,767,006 or $3.46 a share for the like 1955 period. Gross income from sales and services was $1,462, 694,392, an increase of 14.22 per cent over the same period last year.

V-C First Quarter Sales, Earnings Up

Unaudited net income of Virginia-Carolina Chemical Corp. for the first quarter ended Sept. 30 was $12,774 compared with a loss of $104,739 for the same period last year, the firm reported.

Net sales were $10,123,085, compared with first (*to page 12*)



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TENNESSEE CORPORATION

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RIGID QUALITY CONTROL

Through Six Basic Chemical and Physical Analysis

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High Water Solubility is a Characteristic of all 3 Grades

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Fine Texture, Highest Porosity, Large Surface Area, Small Particle Size, for Maximum Ammoniation-Granulation.

GRANULAR

Dust Free, Free Flowing, Uniform Particle Size, Medium Hardness, No Bridging Over, for Direct Soil Application.

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For Intermediate Ammoniation to Produce a Semi-Granular Product. Also Affords Excellent Compatable Mixing with Granular Potash, for Minimum Segregation, in Alkaline Grades.

Ready For Immediate Processing

A fine texture, small particle size, Triple Superphosphate produced under exacting chemical and physical structure control from the raw materials to the finished product. 46% available P_2O_5. Faster and more complete agglomeration. Maximum ammoniation in a minimum of time.

Pre-shipping conditioned for immediate inclusion into your processing. Save time—reduce cost and eliminate uncertainties with U. S. Phosphoric Products preconditioned, high ammoniating Triple Superphosphate.

There's a **BRADLEY & BAKER** office near you. Their representative would be pleased to consult with you on your requirements and to advise on your most convenient delivery routings.

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TAMPA, FLORIDA

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Norfolk, Va.

(*from page 10*) quarter sales of $9,667,009 last year.

William C. Franklin, chairman of the V-C board of directors, said that "first quarter operating results are a very small proportion of the total results for the entire fiscal year, primarily because of the seasonal nature of our fertilizer sales and distribution. For this reason, first and second quarter earnings cannot be indicative of anticipated earnings for the entire year."

Fewer Injured at Work Than at Play

DuPont Co. has discovered that nearly twice as many of its employees get hurt in sports as at work. Counting up lost-time injuries among its 100,000 employees over the last three years, the company found that 515 were hurt while participating in various sports, while only 265 were injured in all the time they spent at work.

Largest number of workers, 202, were injured playing baseball. Basketball accounted for 58 and swimming for 43. Football threw 26 for a loss. Skating, hunting, fishing, vowling and boating were also in the league. The apparently harmless volley ball injured 11.

The company is campaigning to cut down these and other off-the-job injuries. Its idea is that every person, from the president on down, is responsible for safety and that if each one will look out for himself and people around him, there need be no injuries.

Shea Phosphorus Furnace Runs 4 Years

After running nearly four years without internal inspection and repair, the No. 1 phosphorus furnace of Shea Chemical Corp. at Columbia, Tenn. is in "remarkably good condition," the firm reports.

The unit was inspected in November, following its shut-down for enlargement when Shea's newest phosphorus furnace, at the same location, began operation.

O. D. Crosby, Shea production vice president, said that phosphorus furnaces of this size ordinarily are shut down for inspection and repair about every year and a half.

Insecticide Used At Olympics

Prior to the arrival of the various athletes participating in the current Olympics the entire village at which they are being housed was treated with Diazinon for fly control.

With Australia now in its early summer season, and temperatures averaging about 71.5 degrees, every effort was made to make them as comfortable as possible. Some 6,000 athletes from 79 nations are involved in the games.

Republic Copper Sulfate Expansion

Republic Chemical Corporation has completed the installation of equipment at the Curtis Bay, Baltimore, Maryland plant for expanded copper sulfate production. Cost of the installation is approximately one million dollars.

Equipment for the production of the material involves the latest electric furnace, crystallizers, driers and stainless steel filters.

World consumption of copper sulfate amounts to one billion pounds, while United States requirements are approximately 120 million pounds.

Penn Salt Chem. Acquires Delco

The directors of both Pennsalt Chemicals and Delco Chemicals have announced approval of a plan by which Pennsalt will acquire Delco. The acquisition will be accomplished by an exchange of stock.

Delco's major activities involve the manufacture and sale of organic and inorganic specialty cleaning and paint stripping compounds.

Delco's operations will continue to be under the direction of its president, Lyle Harbour, and its Vice President and General Manager, A. F. Slover.

Re-Mark Expansion

Re-Mark Chemical Co. is planning to spend $100,000 to expand its recently acquired $125,000 fertilizer plant at Goulds, Fla. Remark is the first chemical venture for multimillionaire Arthur Vining Davis.

Pennsalt Buys 2 Two-Tank Barges

Two unusual barges, designed to carry caustic potash and caustic soda simultaneously, have been ordered from Dravo Corp. by Pennsylvania Salt Mfg. Co.

The 175-foot open hopper barges each contain two individual cargo tanks. Each tank is divided by a bulkhead into two compartments of unequal size, the larger having about six times the volume of the smaller. Smaller compartments each will hold 15,000 gallons of caustic potash, the larger, 90,000 gallons of caustic soda.

CFA Awards Two Scholarships

One hundred dollar scholarships have been awarded James W. Bailey and Eldridge E. McKinzie of the Kellogg, Voorhis campus, California State Polytechnic College by the Soil Improvement Committee, California Fertilizer Association.

The committee makes four $100 scholarships awards each year to students in soils and crops classes on the San Luis Obispo and Kellogg-Voorhis campuses of Cal-Poly.

IMC Wilmington, N. C. Plant Closes

The Wilmington, N. C., office and plant of International Minerals & Chemical Corp. have been closed and the office moved to Winston-Salem, N. C. New address is Box 4145, Winston-Salem.

Italian Firms Plan Pakistan Fert. Plant

A $35.7 million nitrogenous fertilizer plant with capacity of 100,000 tons per year is planned to be built at Multan, western Pakistan, by two Italian firms, Montecatini and An-Saldo. To help meet costs, the U. S. government has advanced $200,000.

Diablamex Opens Mex. City Sales Off.

Diamond Black Leaf de Mexico S. A. de C. V. has opened a new sales office in Mexico City at Av. Juarez 42. Better known in Mexican commercial circles as "Diablamex," the firm has announced two promotions in its executive organization.

Bruce D. Knoblock, formerly with General Motors de Mexico S. A., is new general manager of "Diablamex."

Jack L. Schack, who has been with Diamond during the past two years in a sales capacity, is

Knoblack

Schack

promoted to sales manager of "Diablamex."

The firm operates a completely integrated insecticide manufacturing plant in the Xalostoc industrial zone of Mexico City. Located on 15,000 square meters of land, the plant presently has more than 75 Mexican employees.

A new Mexican firm, Insecticidas y Fertilizantes Diamond del Norte S. A., located at Matamoros, recently was organized to manufacture liquid and dust insecticides. General manager is Ing. Luis Briones Moreno, former general manager of Insecticidas y Fertilizantes, S. A. Its assets and business were acquired by the new firm, which will have access to engineering, research and technical facilities of Diamond Alkali.

'The Rival World' Color Film Available

"The Rival World," a color movie which has won awards at five international film festivals, was expected to be available, free of charge, for showings by interested organizations by Nov. 15. Produced by Shell, this movie describes the struggle for survival between man and disease-bearing, crop-destroying insects.

A locust invasion of the Sudan and East Africa is shown, together with a dramatic sequence taken from planes during the aerial spraying of flying locust swarms. "The Rival World" tells how science is devising methods of fighting enemy insects. It points out that man can master this "rival" world only by marshaling his resources and encouraging scientists to improve and increase insect control methods.

Order by writing to one of the Shell Oil Film Libraries: 100 Bush St., San Francisco; P. O. Box 2099, Houston; 624 S. Michigan Ave., Chicago; or 50 W. 50th St., New York.

N. Y. Residents Urged to Increase Pest Control

State Senator Alfred E. Santangelo at a recent press conference reported that insects cost New Yorkers almost $75 million a year, and that the problem becomes increasingly serious.

He urged residents of the metropolitan New York City area to intensify their efforts in combatting pests, noting that the Home Insect Control Bureau reports that the New York City area has the dubious distinction of housing, proportionately, the largest cockroach population of any of the 12 major cities of this country surveyed by the bureau.

Ship Dieldrin for Indonesian Campaign

The second part of a 100,000 pound shipment of dieldrin left San Francisco early in November bound for Indonesia's spray-can army now fighting a house-to-house battle against malaria, reports Shell Chemical Co. The shipment brought the total amount of dieldrin sent to that country since May to 900,000 pounds.

In May, the Indonesian government began a five-year campaign to eradicate malaria-bearing mosquitoes from an area where 30 million people live. Since the program began, the number of new cases of malaria in adults has begun to decline, they report.

Dieldrin is manufactured by Shell, and shipments of the insecticide from San Francisco were blended into required formulations at Olin Mathieson Chemical Corp.'s Fresno plant.

OM Office Mgrs. Complete Course

Office managers from district sales offices of Olin Mathieson Chemical Corp.'s Plant Food Div. recently completed a week-long training course in new business skills at Little Rock headquarters and at Houston Tex.

At the conclusion of the course, the entire group was initiated into the National Office Managers Assn. New NOMA members include Al Smartt, North Little Rock; Fisher Watson, Jackson, Miss.; Donald Maca, Omaha; Charles Dunlap, Houston; Weldon Henry, St. Louis and Robert Burke, Phoenix, Ariz.

Jos. Mullen, division gen. mgr., looks on as Robt. Burke receives membership certificate from B. B. McLendon, div. asst. controller and pres. of NOMA's Little Rock chapter.

Form New Dealers Assn. in Fla.

After spending 12 weeks studying technical problems concerned with the garden supply industry, South Florida members of the trade on November 12 formed a trade association, the South Florida Garden Supply Dealers Association.

First objective of the group will be the elimation of price wars and unfair trade practices. Next, they plan a training program to bring about better merchandising.

It was voted to include wholesale suppliers, manufacturers, or anyone interested in the trade, with voting privileges limited to one vote per store or company. The organization had 30 members who paid initial dues of $10 per year.

Officers are C. R. Pinkerman, Garden and Pet Supply, president; Mrs. James Bordon, Normandy Isle Seed Store, secretary; Norwood Glover, Hector Supply Co., treasurer.

LEFT: Charles Wilson, Calspray factory representative, pays membership dues to Norwood Glover. BELOW: Assn. officers—Mrs. James Bordon, secty.; Norwood Glover, treas.; and C. R. Pinkerman, president.

AAC Plants Report Perfect Safety Records

Perfect safety records for one or more years were reported in November from nine plants of The American Agricultural Chemical Co.

Those with no lost time injuries were Henderson, N. C.; Spartanburg and Columbia, S. C.; Pierce, Fla.; Chambly, Quebec; Three Rivers, New York; Norfolk, Va.; Cleveland and Cairo, Ohio.

AAC said that its Henderson and Spartanburg plants now have completed three successive years without a lost time accident and the Pierce and Chambly plants, two years.

Pyrethrum Plant Begins Prod. in Congo

The Belgian Congo's first pyrethrum extraction plant—Chimiphar, at Bukavu—now is reported in production under the direction of Alois Saelens, its builder and owner. Saelens, who recently visited the United States to confer with American pyrethrum processors, states that he is prepared to extract pyrethrins from 2,700,000 pounds of blossoms a year.

TIME IS MONEY... SAVE BOTH!

ORDER NITROGEN PRODUCTS FROM SINCLAIR NOW

There are two big reasons why you should sign now with Sinclair for your supplies of nitrogen solutions, anhydrous ammonia and aqua ammonia.

First – the completion and opening of a centrally-situated new plant in Hammond, Indiana, means substantial savings in delivery time and shipping costs for most Mid-West nitrogen users.

Second – your seasonal supply problem can be solved by this plant's vast storage capacity... products will be delivered when you need them to meet your production schedule.

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155 North Wacker Drive, Chicago 6, Illinois – Phone Financial 6-5900

. . . Business & Management

Lafayette Operates New Liquid Fert. Plant

Lafayette Farm Supply of Lexington, Mo., has just begun operation of its new complete liquid fertilizer plant, serving the Missouri River Basin area in the western part of the state.

Engineered by Ellsworth Equipment & Engineering Co., the installation includes anhydrous ammonia converter and a completely automatic mixing system, known as Hydro-Cycle. Plant capacity is fifteen tons per hour.

Phoenix Site for Stauffer's 17th Plant

Another unit in its 17-plant network of farm chemicals plants has just been established by Stauffer Chemical Co. at Phoenix, Ariz. The new project, which will compound and formulate a range of Stauffer specialties, will be capable of serving the entire state, the firm reports.

The project will operate as a relatively autonomous regional enterprise.

Battelle Studies Aerosols for Army

Research on the basic behavior of moving aerosols has been started at Battelle Institute under a $135,000 contract with the U. S. Army Chemical Corps.

Subjects to be studied by Battelle, under the direction of Dr. J. Mason Pilcher, include changes that occur in moving aerosol streams, methods of diluting moving aerosols and accuracy and repeatability of aerosol sampling procedures.

Spencer Sales, Profits Increase

Spencer Chemical Co. reports improvement in both net profits and sales for the first quarter of its fiscal year ended Sept. 30 over those for the same period a year ago.

Net earnings were $733,519, compared with $564,068, or 37 cents a share, a year earlier. Net sales for the quarter were $9,070,672, up from $7,717,696 in the same 1955 period.

Directors have voted the usual quarterly common dividend of 60 cents a share and quarterly preferred dividend of $1.05 a share, both payable Dec. 1 to holders of record Nov. 9.

PEOPLE

American Agr. Chem. Co. personnel changes: J. E. Morgan to production superintendent at London, Ont., plant; S. J. Thompson to superintendent at Port Hope, Ont.; D. W. Newbauer, production superintendent at Cairo, O.; G. E. Richardson, superintendent, Charleston, S. C., plant; C. L. Harris, superintendent, Columbia; J. D. McMurray to the New York City Fertilizer Sales Dept.; Edgar B. Stalnaker, assistant sales manager, Carteret, N. J.; F. H. Herold, chief chemist, Chemical Control Dept. lab at East St. Louis, Ill.

American Potash & Chem. Corp. Dr. Donald Garrett has been named assistant manager, Trona Research Dept., and Stanley Cohen, head of the department's New Products Section.

The firm has established a Plant Engineering Section at the Los Angeles plant, with Fred Torn as head. Charles Field goes to the LA plant as formulations chemist.

At AP&C's main office in Los Angeles, Joseph Adinoff has been promoted to senior development engineer and James A. Smith to personnel supervisor.

Balfour, Guthrie & Co., Ltd. George B. Simons has been appointed field supervisor for North Dakota and western Minnesota.

Coop. G. L. F. Exchange. Michael J. Papai succeeds Robert B. Lenhart as assistant director of purchasing. His specific duties will be to handle purchasing of pesticides. E. H. Phillips, director of purchasing, who formerly handled pesticides, will now take over plant food chemicals and packages as well as miscellaneous farm chemicals.

Diamond Black Leaf Co. Appointment of Darl E. Snyder as eastern district sales manager is announced. With headquarters at 332 N. Queen St., Lancaster, Pa., Snyder will supervise merchandising and sale of the firm's products in a 14-state area from Maine to North Carolina.

Snyder

Federal Chemical Co. William Q. Harned, 73, secretary-treasurer, died in Louisville, Ky., on Sept. 28. He had been with the firm 40 years.

Jackson B. Hester Agr. Research Laboratories. Dr. Hester has just returned from a visit to Brazil after making a study of tomato, sugarcane and coffee production of the S/A Industrias Reunidas F. Matarazzo.

. . . People

Wilson & Geo. Meyer & Co. Promotions and transfers: Philip A. Sawyer, to assistant manager, agricultural chemical sales, Southwest territory; Richard T. Swanson, Jr., to San Francisco, where he will take charge of peat moss sales; Donald Deggendorf to the agr. chemical sales staff at San Francisco; and Leland Oberholser to the agr. chemical sales staff at Los Angeles.

Miller Chemical & Fertilizer Corp. E. Russell Rouzer, former district manager, has been named technical supervisor of liquid fertilizers. His headquarters will be at Hanover, Pa.

Rouzer

Mississippi River Chemical Co. Promotion of Richard G. Powell to director of technical services is announced by John L. Sanders, sales manager. Powell will direct the activities of the department in association with Bradley & Baker, distributors for MRC.

Powell

Monsanto Chemical Co., General Development Dept. Henry E. Wessell has been appointed manager of marketing research and John O. Printy, manager of commercial development.

Nitrogen Div., Allied Chemical & Dye Corp. Isaac Swisher has been named sales supervisor, direct application materials, in the Illinois district. Previously, he was in charge of Arcadian 12-12-12 sales in the Midwestern area.

National Potash Co. John J. McBride joins the firm as traffic manager. He had been assistant traffic manager of Mutual Chemical Div., Allied Chemical & Dye Corp.

McBride

William B. Porterfield, Jr. has been named sales representative for National Potash in the south and southwestern states.

Olin Mathieson Chemical Corp. Harold A. Ford is new assistant manager of nitrogen products, Industrial Chemicals Div. He had been sales representative in the Kansas City area for Westvaco Chlor-Alkali Div., Food Machinery & Chemical Corp.

Ford

Potash Co. of America. Appointment of F. Edward Smith, Jr., as assistant to the vice president in charge of sales recently was announced. A PCA employee since 1938, for the past few years he has handled sales in the Northeastern and Canadian territory.

Smith

Roberts Chemicals, Inc. Gerald P. Tinney will handle sales of agricultural chemicals throughout the eastern United States. A graduate of West Virginia University, he received a BS degree in Agriculture.

Smith-Douglass Co. Russell Spivey, former manager of the Smith-Rowland Div., has joined

Spivey

Gavaza

the parent company as fertilizer sales manager for the Norfolk branch. At the same time, L. Gavaza became manager of the Smith-Rowland Div.

Southern Nitrogen Co. Robert H. Farrow, formerly with Spencer Chemical Co., has been

Farrow

Heck

named director of market research for Sou. N. The firm also announced promotion of Robert Heck from technical service representative to director of technical service.

Spencer Chemical Co. Ned P. Haldeman will be the company's new agricultural chemicals sales representative in Mississippi and Louisiana, replacing Tom Campbell, who becomes representative in North Carolina.

Stauffer Chemical Co. George C. Ellis has been appointed a senior vice president of the firm and general manager of the West End Chemical Co. Div. He also has been elected to Stauffer's board of directors.

U. S. Industrial Chemicals Co. Alden R. Ludlow, Jr. is

. . . People

Ludlow

named director of sales, succeeding Lee A. Keane who has just retired. Ludlow has been USI's manager of alcohol sales for the past 10 years.

U. S. Potash Co., Div. of U. S. Borax & Chemical Corp. L. Ralph Boynton has been named assistant sales manager. He has been southern sales manager for the past year, operating out of Atlanta. He will move to New York as assistant to John E. Fletcher, sales manager.

Boynton

Robert H. Walton is promoted to manager of the Atlanta office, succeeding Boynton. A U. S. Potash employee since 1933, he has been in the Atlanta sales office for the past six years.

Walton

Stough

Joe Stough joins the firm as sales representative in the midwest territory. Prior to his new position, he served as district manager for Davison Chemical Co. at Charleston, S. C.

Virginia-Carolina Chemical Corp. Alfred J. Dickinson has been named assistant to the president of V-C.

Associations & Meetings

Miss. Insect Control Conference Scheduled

Insect resistance and dangers of phosphate insecticides will be general themes of the third annual Mississippi Insect Control Conference at Mississippi State College, Jan. 10–11, 1957.

Panel discussions scheduled and their moderators include one on insect resistance, Dr. John Johnson, National Cotton Council; Use of Phosphates in Cotton Insect Control, O. T. Guice, Mississippi State Plant Board; Problems of Aerial Application of Insecticides, Mabry Anderson of Clarksdale; Functions and Research Findings of USDA on Pests, C. C. Fancher, Southeastern Plant Pest Control Region.

Chairmanships of sessions will be handled by A. G. Bennett, extension entomologist at State College; Dr. Ross Hutchins, head, State Plant Board; and Dr. Clay Lyle, dean and director, Div. of Agriculture at Mississippi State College.

The annual conference will also include the annual business meeting of the Mississippi Entomological Assn. David Young, assistant extension entomologist and association president, will preside.

PNPFA Convenes at Harrison Hot Springs

November 7–9, members of the Pacific Northwest Plant Food Association met in the Harrison Hot Springs Hotel, Harrison Hot Springs, British Columbia, for their seventh annual convention.

The meeting was opened by Frank Meeker, chairman of the association. Topics discussed included "Deposits in Your Soil Bank;" "How to Read Deficiency Symptoms in Plants;" "Crop Life Views the Fertilizer Industry;" and "Our Job and How We Do It" by the directors of the Washington, Oregon and Idaho Depts. of Agriculture.

Among the recreational activities planned for delegates were the annual banquet, golf tournaments, bingo party, cocktail parties and dancing.

Velsicol's Sauer Chairman of Seminar

Dr. Robert Sauer, vice president of Velsicol Chemical Corp., served as chairman of the American Management Association Workshop seminar held Oct. 1–3 at the Sheraton-Astor Hotel in New York.

Sauer

Topic of the seminar under Dr. Sauer's direction was "Management of Applied Research."

Cotton Prod. Conf. May Draw 900 People

Information on how to get the cost of growing cotton down and its quality up will be presented at the second annual Cotton Production Conference in Birmingham Dec. 13–14.

Sponsored by the National Cotton Council, in cooperation with workers in Cotton Belt land-grant colleges, USDA, the farm chemicals industry and other organizations, the conference is expected to draw between 800 and 900 persons.

Topics to be presented include research on soil-water-plant relationships, cotton breeding, disease control, weed control, defoliation and insect control.

The production conference will be preceded by open meetings of technical groups on cotton defoliation and disease control Dec. 12, and cotton improvement, Dec. 11–12.

Indiana Fert. Conf. Held at Purdue U.

A well-rounded program was planned for the Indiana Fertilizer Conference, held Nov. 27 and 28 in Purdue Memorial Union, Lafayette, Ind. The fertilizer industry cooperated with Purdue University Agricultural Experiment Station and Agricultural Extension Service in sponsoring the affair.

Panels discussed "Latest Results with Fertilizer-Insecticide Mixes" and "Pros and Cons of Changing Fertilizer Guarantees from the Oxide to Elemental Basis." On the first panel were G. E. Gould, Entomology Dept., Purdue, chairman; Leo Orth, Sinclair Chemicals, Inc.; and V. L. Sheldon, Olin-Mathieson Chemical Corp.

Among the papers presented were "New Developments in Fertilizer Placement Machinery," by J. B. Liljedahl, Purdue; "Irrigation in Relation to Fertilizer Use," Dan Wiersma, Purdue; "Crop Response in Relation to Soil Levels of Available Phosphate and Potash," S. A. Barber, Purdue; "The Soil Bank and Fertilizer Usage," W. R. Allstetter, National Plant Food Institute vice president; and "What's in the Price of Fertilizer," A. H. Bowers, Swift & Co.

Custom Spray Oper. School at U. of Ill.

The 1957 insect outlook, latest insect control methods and new agricultural chemicals are among the long list of topics for the ninth Custom Spray Operators' School to be held at the University of Illinois Jan. 24–25, 1957. All sessions will be held in the Illinois Union on the campus.

H. B. Petty, extension entomologist in charge of the school, says all custom spray operators, agricultural chemical salesmen, dealers and other interested persons are invited to attend.

First Southern Soil Fertility Conf.

SOIL scientists and fertilizer industry representatives from thirteen southern states attended the first annual Southern Soil Fertility Conference at the Atlanta Biltmore Hotel, Atlanta, on Nov. 2. The Southern Regional Soil Research Committee, consisting of soil scientists from the thirteen southern land-grant colleges and USDA, sponsored the conference with the National Plant Food Institute.

Among the speakers were Dr. L. B. Nelson, head of the Eastern Section, Soil and Water Conservation Research Branch, USDA; W. R. Thompson, pasture specialist, Mississippi State College; Dr. M. S. Williams, chief agricultural economist of NPFI; and Dr. J. W. Fitts, head, Department of Soils, N. C. State College.

Off-Season Potential

"Pastures and hay lands constitute the most neglected segment of our agriculture," said Dr. Nelson, in his presentation titled "Off-Season Fertilizer Potentials in the South." "Potentials for fertilizer on pastures and hay lands during the summer and fall months are particularly great," he continued.

"The farmer must utilize his highest cost item, namely labor, efficiently," he emphasized. "In the spring, labor loads on the farm are at their peak. For this reason, all operations possible need to be taken care of in advance."

Thompson's Talk

W. R. Thompson said that "it pays to band seed and band place fertilizer on most of our pasture grasses, clovers and legumes . . . Sod seeding is a method of pasture building and maintenance," Thompson pointed out. "It offers an excellent means of controlling soil erosion, plus the growing of winter grazing crops on permanent sods without any damage to the next year's sod growth. This is not a new program. It has been used over a period of 10 years and has proven its worth in pasture building, especially the winter grazing phase of it," Thompson noted.

NPFI's Dr. Williams told the conference that "acres placed in the soil bank can be enhanced in value with sound land management, including the application of needed plant food . . . We must not let excess supplies of some farm products blind us to the continuing and pressing need for increasing efficiency in agriculture today," he continued. "With the price-cost squeeze still a problem, more than ever before we must avail ourselves of every opportunity to lower the per unit cost of production."

Among participants at the conference were Dr. Russell Coleman, exec. vice pres. of the National Plant Food Institute; Dr. W. E. Colwell of No. Carolina State College; and C. T. Prindeville, NPFI president.

Fertilizer Ratios

"During the past 10 years, soil testing has become an important tool in determining fertilizer requirements for different crops and soils," stated Dr. J. W. Fitts. "Field experiments throughout the south, along with summaries of soil test results, have given valuable information about the fertility status and needs of the soils in the various states," he added.

"In 1954, a subcommittee was appointed by the Southern Soil Research Committee to survey the use of fertilizers in the South to determine what fertilizer ratios were needed. After studying all the information available, agronomists in various states found that a surprisingly few ratios are necessary to take care of all soil conditions within the states," said Fitts.

"Selecting a list of fertilizer ratios with a minimum grade in each ratio was suggested by the subcommittee. States may select all of the ratios on the list or only part for their official recommendation. Of those selected, however, the minimum grade permitted would be the same throughout the southern region, while the number of grades permitted above the minimum grade would be the responsibility of each state. Only ratios with whole numbers were recommended by the committee."

New MCA Members

Three new members have joined the Manufacturing Chemists' Association—J. R. Simplot Co., National Research Corp. and Purocaine, Inc.

Chemical Processing Staff Photo

60,000 tons to distribute yearly; lots as small as 25 lbs.

International Salt Company chooses Michigan for rehandling job in new Chicago warehouse

This world-famous company, largest producers of salt in America, have a tremendous material-handling problem at their recently-completed, completely-modern warehouse in Chicago. Into this huge, arched, cathedral-type building 178 feet long, 162 feet wide, and 70 feet high comes 60,000 tons of salt a year. All of it—120,000,000 pounds, in 10 different types and sizes—has to be re-handled for shipment. Some lots run 50 tons or more each... some are as small as 25 pounds. One tractor shovel does *all* re-handling from stockpiles, feeding the salt, on order, to centrally-located weigh hoppers for bagging or bulk shipment (same unit also loads bulk salt, at times of peak demand, directly into trucks).

Tractor Shovel is key to operation

In selecting this tractor shovel, so important to the entire operation, prime considerations were:

1. Large capacity
2. Speedy handling
3. Utmost safety and
4. Low maintenance costs.

In the opinion of International Salt Company officials, *only one machine passed ALL tests with flying colors: a Michigan Tractor Shovel!*

Chosen from 6 models

With six basic models, 44 to 165 hp, and buckets from 6 cubic feet to 5 cubic yards, to choose from, International Salt Company picked the 80 hp, 1 cubic yard, bucket wheel drive Model 75B you see here.

This unit, like all Michigans, gives International Salt the efficiency only a matched all-Clark-designed and built power train can give. No-clutch shifting to change speeds and direction at the flick of a lever. Power steering. Shock absorbing torque converter with 3-to-1 torque multiplication. Forward *and reverse* speeds to 26 mph. Adequate power and weight, plus low-level rollback and low-level-carry, to get and deliver heaping loads. Utmost safety, with big brakes and excellent all-around visibility. Planetary axles which *completely eliminate axle breakage.*

See Michigan in action

No matter what kind of bulk material *you* have to handle—fertilizer, foods, sand, or chemicals—these Michigan features are well worth checking. It's simple to do. Write or call us any time. We'll be glad to help you analyze which size Tractor Shovel best fits your needs . . . then show you that machine in action, in your plant, doing the jobs you want to see done!

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. . . Assns.

Show NPFI Film At Okla. Conference

The National Plant Food Institute's new color film, "The Making of a Miracle" led off the program for the twelfth annual Oklahoma Crops and Soils Conference, held Nov. 29 in the Student Union Ballroom at Oklahoma A & M College, Stillwater.

Guest speakers included Dr. Oliver S. Willham, president, Oklahoma A & M College; Dr. Hugo O. Graumann, and Dr. L. B. Nelson, USDA; Professor Jay Porterfield and Dr. D. E. Bryan, Okla. A & M College.

New Date for West. Cotton Prod. Conference

A change in dates for the 1957 Western Cotton Production Conference has been announced. Originally slated for March 5 and 6, the conference has been rescheduled for March 4 and 5 because of a conflict with another meeting. Conference headquarters will be the Hotel Westward Ho in Phoenix, Ariz.

Southern Control Off. Plan June Convention

The Association of Southern Feed & Fertilizer Control Officials has announced that its 15th annual convention will be held on June 17, 18 and 19 at the Dinkler-Tutwiler Hotel, Birmingham, Ala. The group suggested that reservations be made early, directly through the hotel.

Date Set for 1957 Convention of NPFI

National Plant Food Institute has just announced that its 1957 convention will be held from June 9 to June 12 in the Greenbrier, White Sulphur Springs, W. Va.

GOVERNMENT

A. P. N. Fert. Ready For Large Production

Ammonium phosphate-nitrate fertilizers are ready for large-scale production in this country in the opinion of Charles H. Young, TVA's manager of chemical engineering.

"We believe we have enough technical information concerning equipment and processes to guide others in starting production," said Young. "Several fertilizer companies have done experimental work on ammonium phosphate-nitrates, but so far as we know there is no actual production in the country."

Advisory Committee Urges More Research

USDA's Forest Research Advisory Committee has urged that new and expanded research be carried out to help owners of small forest properties make a larger contribution to our supply of high-quality forest products.

One research need cited by the group was on tree physiology, especially as related to fertilizing forest stands.

Census Report on Fertilizer Firms

In 1954, 580 firms in this country were primarily engaged in mixing fertilizers from purchased fertilizer materials, according to an advance report of the 1954 Census of Manufactures. These firms employed 12,040 people with total payroll of $38,480,000, while in 1947, only 11,615 persons were employed in this activity.

Two hundred sixty companies' primary activity was mixing fertilizers from one or more materials produced in the same establishment, the report continues. Annual payroll was $73,048,000 to 19,728 employees.

Tolerance Actions

Dow Chemical Co. filed a petition for tolerance of 5 ppm for residues of sodium 2,2-dichloropropionate as 2,2-dichloropropionic acid in or on sugar beets, with or without tops.

Geigy Agricultural Chemicals withdrew its petition for establishment of a tolerance for residues of Diazinon on apples, cabbage, cherries and pears.

Proctor & Gamble Co. filed a petition for exemption from the requirement of tolerance for residues of ethylene oxide in or on copra.

A tolerance of 1 ppm was approved for residues of 3-(3,4-dichlorophenyl)-1, 1-dimethylurea in or on cottonseed, pineapple, potatoes and sugar cane and 2 ppm in or on alfalfa and grass crops.

Malaria Mosquito Isn't DDT Resistant

TVA's director of health, Dr. O. M. Derryberry, has reported that data thus far suggest the malaria carrying mosquito *A. quadrimaculatus* may be incapable of developing resistance to DDT.

"In field tests this year," he said, "which attempted to duplicate experiments made in 1944 on DDT-treated houses, data and observations indicated that the behavior pattern and reaction of adult *A. quadrimaculatus* to DDT-treated surfaces remain essentially the same as in 1944, even after natural exposure for 12 years in an area where DDT and related insecticides have been used repeatedly."

Calendar

Dec. 3. Minn. Soils & Fert. Short Course, Coffey Hall Aud., St. Paul Campus, Univ. of Minn.

Dec. 3-5. CSMA Annual Meet., Mayflower Hotel, Washington, D.C.

Dec. 6-7. Ala. Soil Fertility Society, Whiteley Hotel, Montgomery Ala.

Dec. 10-12. North Cent. Weed Control conf., Sherman Hotel, Chicago, Ill.

Dec. 12. SAACI Christmas Party, Waldorf-Astoria Hotel, NYC.

Dec. 12. Amer. Society of Agr. Eng., Power & Mach. Sect., in cooperation with Nat. Joint Comm. on Fert. Application, Edgewater Beach Hotel, Chicago.

Dec. 13-14. Soil Fertility & Plant Nutrition Short Course, Univ. of Mo., Columbia, Mo.

Dec. 27-31. Ento. Society of America, Annual Meet., Hotel New Yorker, N.Y.C.

Jan. 8-9, 1957. Tex. Fert. Conf., Texas A&M, College Station.

Jan. 9-10. Wisc. Insect Control Conf., Loraine Hotel, Madison, Wisc.

Jan. 10-12. NE Weed Control Conf., McAlpin Hotel, New York.

Jan. 21-25. Pacific NW Vegetable Insect Conf. and NW Coop. Spray Project, Imperial Hotel, Portland, Ore.

Jan. 23-24. Pacific NW Agr. Chemicals Industry Conf., Benson Hotel, Portland, Ore. Sponsored by Western Agr. Chemicals Assn.

Jan. 23-25. Southern Weed Conf., Bon Aire Hotel, Augusta, Ga.

Jan. 28-29. National Cotton Council, annual meeting, St. Louis, Mo.

Jan. 31-Feb. 1-2. Agr. Aircraft Assn. annual convention, Senator Hotel, Sacramento, Calif.

Feb. 4-6. Cotton States Branch, Ento. Society of America, Birmingham, Ala.

March 6-8. NAC Assn. Spring Meeting, Fairmont Hotel, San Francisco.

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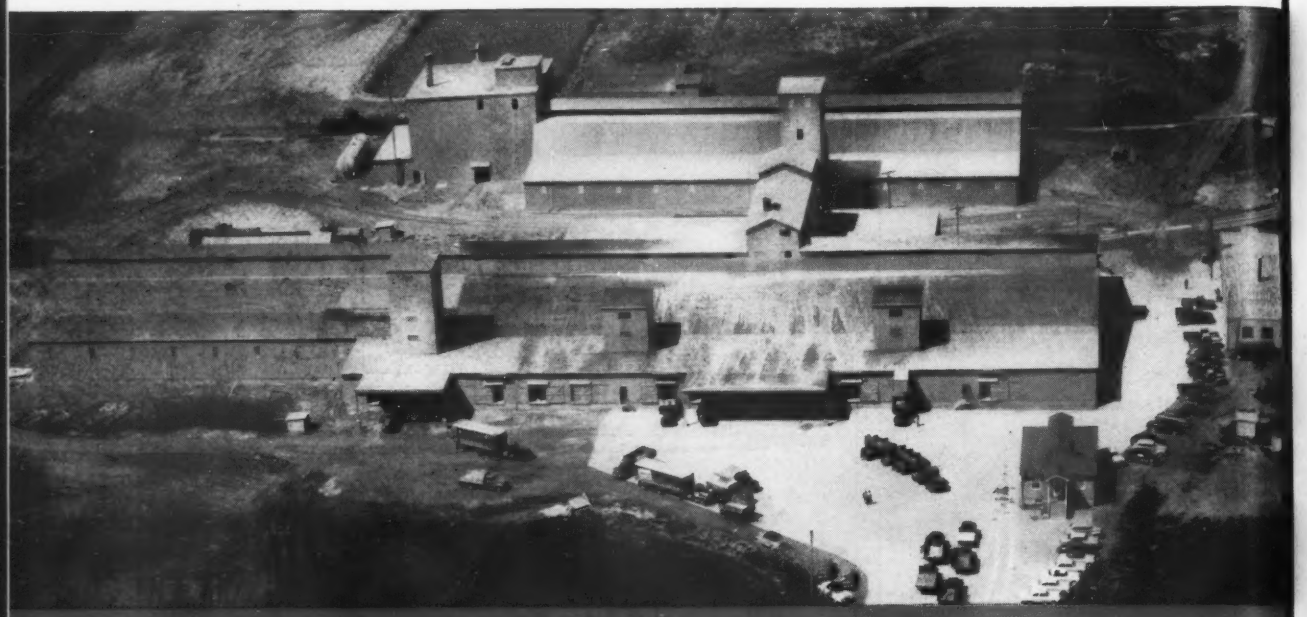

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VIEWING WASHINGTON

with Farm Chemicals Washington Bureau

on agriculture

The chemical industry, as well as business generally, can look forward to four more years of a "friendly" administration in Washington. There will be no rocking of the economic boat as a result of the elections. While there are some new faces in a Democratic-controlled Congress, generally legislative business is to be controlled by conservatives.

Many Eisenhower aims and programs—stated and started during the past four years—are to be pushed more vigorously during the next four. Such as: Less government in business, a sound dollar, a balanced budget and thriving industry. One of the results of the Eisenhower landslide is to be that Ike will be much more insistent about getting his programs through Congress than in the past—based on the tremendous popular following shown him in the elections.

But don't look for any easing of the "tight money" policy now that the White House has been re-won. Inflation, rather than deflation, still is the big force to be harnessed. It's to be the Administration's toughest domestic policy problem in 1957. Officials say there will be no let up in the new year, as far as can be seen now, and even hint of some further tightening—making business loans even tougher to come by.

The "potentiation" abilities of organic phosphate insecticides—newly discovered by the Food and Drug Administration—is bringing on a crackdown on safety controls on such insecticides used on food crops. FDA Commissioner Larrick said it has been found essential to test the organic phosphate insecticides for "potentiation"—an increase of toxicity which has been found to occur when some of the compounds are used together.

In considering petitions for tolerances for organic phosphate insecticides, FDA now will require experimental proof showing the toxicity of the compound when fed to test animals with each of the other organic phosphate pesticides that has a tolerance at that time. This requirement will be relaxed if additional scientific evidence shows such action can be taken without hazard to the public health.

Watch for new consumer-group attacks on FDA handling of antibiotic food preservatives. There are hints that a congressional airing of FDA policies regarding the antibiotics may be in the wind.

Complaints are based primarily on the fact that no effective control on the use of one of the two food-preserving antibiotics exists. FDA altered a long-standing policy a year ago when it authorized one antibiotic for food-freshness purposes, but the company involved has a sanitation clause in its franchise. A new-comer to the field, however, does not franchise and makes its product available to all poultry processors. Antibiotics so far are permitted only in the processing of poultry products.

Fear of consumer groups is that the antibiotic may be used to hide poor quality birds. Also, that more than the permitted amount of antibiotic may be left on the bird when it gets to the housewife. This gives rise to possible human intake of the antibiotic from eating treated birds.

VIEWING WASHINGTON

on business

Federal agricultural price and income programs for the next four years will continue about as they have during the past four, as a result of the elections. The controversial Agriculture Dept. boss, Ezra Taft Benson, has won pretty substantial vindication of his policies and programs. While some farm dissatisfaction reduced Ike's vote in rural areas, on the whole, the vote indicated most farmers are willing to go along with Ike—and will ride with anything he thinks is right for them.

For industries selling the farm market, it means there will be no sudden upward spurt in farm buying power next year. Income-boosting price supports are to be kept at levels not likely to contribute to higher farm income. The Administration's aim is to raise farm income over a period of years—as present surplus stocks are whittled down, and as production gets down to the demand level.

Secretary Benson, now apparently firmly in the saddle, plans no major farm proposals to Congress this winter. This means price supports will be kept flexible, and that the Soil Bank will be continued about as is—unless Congress persuades the President otherwise, but this will need truly bipartisan legislation. Drastic or sharp changes in farm policy direction are not in the wind—guaranteed by the presidential veto.

The price support issue—present flexibles versus high, rigid supports, is by no means dead. Democrats, heartened by some congressional upsets in rural areas, plan to get the House on record for fixed 90 per cent supports in 1957 and then get Senate approval in 1958—with the idea of taking over more congressional and Senatorial seats in the 1958 elections.

Farmers decide December 11 what kind of programs they want to operate under in 1957 for corn, cotton, peanuts and rice. Referendums on these major crops will be held on that date. Here are the issues:

Corn—Growers in the 893 counties designated as the commercial area will choose between a return to acreage allotments at 37 million acres for 1957 (in effect until last year), and a continuation of base acreages of 51 million acres (put into effect by administrative order this year). Announced conditions under both programs make it a good bet farmers will go with the base acreage program—for the simple reason that it permits them to raise more corn.

Cotton—Growers will again choose between stringent marketing quotas and relatively higher supports, and no effective production controls with insignificant supports. The upland cotton quota (which is the main cotton crop) has been announced at 11 million bales on a national allotment of 17.4 million acres, the same as this year. Odds favor overwhelming grower approval of quotas.

Peanuts—Referendum will be on a 3-year extension of quotas and allotments—1957, 1958 and 1959. Quotas would be about the same as for the past year. Odds favor approval of 3-year extension.

Rice—Vote will be on continuing quotas and allotments for another year, with 1,652,000 acre minimum allotment. Quotas will be amount grown on that allotment. Grower approval is expected, but not certain.

Further details on the 1957 Soil Bank program will be announced by the Agriculture Dept. in January. So far, only the wheat acreage reserve program and the overall conservation programs have been announced.

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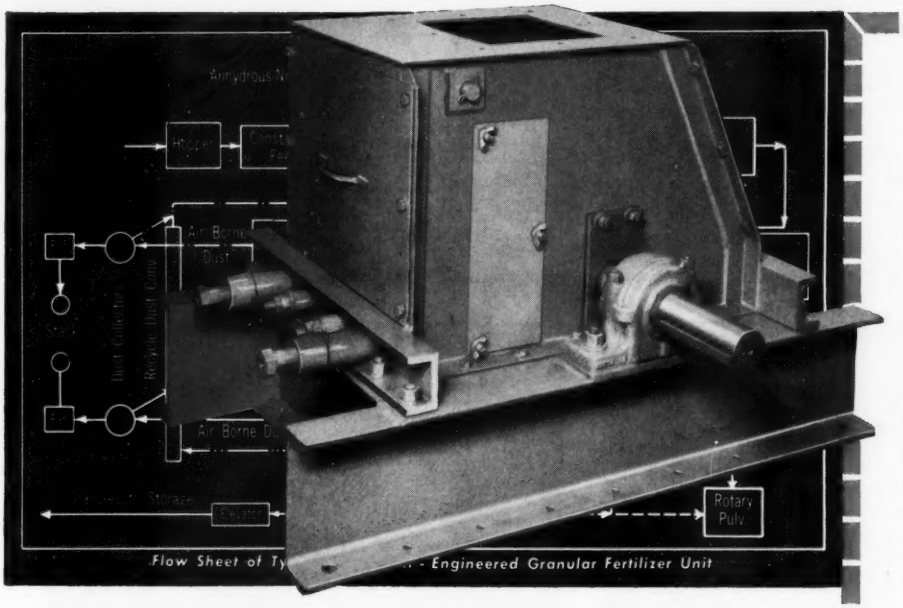

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IN SUGAR BEETS, POTASH-ENRICHED FERTILIZERS MAKE THE DIFFERENCE

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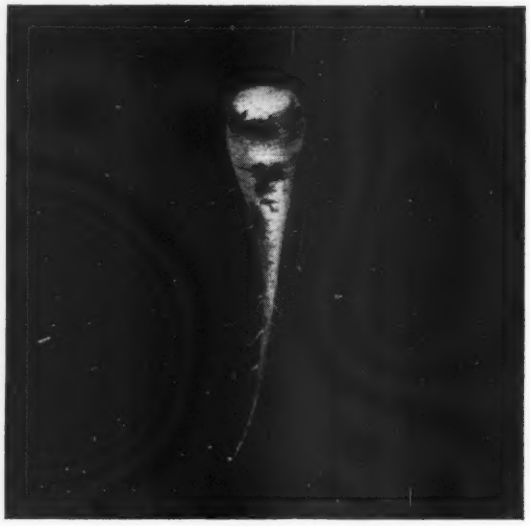

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Today's experienced farmer knows the importance of replenishing his soil regularly with balanced fertilizers. Whether he grows sugar beets or soybeans, good soil—through balanced fertilizers—makes the difference. And it's the potash in these fertilizers that protects crops from plant diseases, improves quality and yield.

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Arcadian® News

Volume 1 | For Manufacturers of Mixed Fertilizers | Number 2

RADICAL PROPOSALS IN MODEL FERTILIZER LAW

Undesirable to Fertilizer Men and Farmers

At the October 21st meeting of the Association of American Fertilizer Control Officials, a resolution was passed putting the Association on record as favoring the change in fertilizer laws in each state of the U. S. to adopt officially the model uniform law worked out by the Association. This model law, if adopted, would bring about a change in fertilizer guarantees of P_2O_5 to P and K_2O to K. It also includes the optional provision for a requirement of "guarantee of the sources from which the nitrogen, phosphorus and potassium are derived."

We believe that every manufacturer of superphosphate and triple superphosphate should oppose this plan to change the fertilizer guarantees of P_2O_5 to P because of the effects such change will have upon the manufacturers of fertilizer materials, upon the manufacturers of mixed fertilizers, and upon the cost and quality of fertilizers offered to the farmer. We believe the industry should oppose this because of the confusion that will result in the fertilizer industry and among farmers in the years required for the transition. Also, we believe industry should be opposed to the scrapping of all the bulletins at our experiment stations, all the technical articles and all the text books that are written in terms of P_2O_5 and which represent the compilation of data from many years of agricultural research and millions of dollars of state and government appropriations expended in their development.

Special Interests Support Proposal

There are certain interests who expect to gain substantial competitive advantages for products such as di-ammonium phosphate, calcium metaphosphate and phosphoric acid. We understand these interests are putting forth very strong efforts to bring about the change in the guarantee of P_2O_5 to P and that, furthermore, they are working actively to lay the groundwork for injecting into the proposed model bill when it is presented to the separate state legislatures, amendments requiring that minimum water soluble phosphorus be guaranteed.

The reasons for the proposed changes, as given by the A.A.F.C.O., is their desire to simplify the terminology used by agricultural writers in reporting results from experiments involving different forms and amounts of plant foods. If this simplification were the sole objective of those advocating these changes, it would appear easier and less disturbing to industry and to agriculture if the agricultural writers were asked to adopt a code of word usage that would eliminate irregularities in their terminology.

To change the fertilizer laws of 46 states is a tremendous undertaking that will involve the time of many people and much expense that might well be applied to useful legislation. In most states the attempted changes are expected to result in severe legislative battles and it is anticipated there will be many defeats as well as many amendments. This would result in less uniformity than presently exists.

Lower Quality—Higher Cost

Those who are unfamiliar with the technical features of the manufacture of mixed fertilizers may fail to appreciate how a change in the guarantee terminology could greatly alter the competitive relationships of fertilizer materials, substantially modify the composition of mixed fertilizers, reduce their quality, and increase their cost to the farmer. But these would be the real consequences of the proposed change from P_2O_5 to P. Let us present two illustrations of a change that may result.

A popular 10-10-10 fertilizer is presently made somewhat as follows:

	% N	% P_2O_5	% K_2O
1030 lbs. 20% P_2O_5 Superphosphate	0	10	0
250 lbs. 41% N. Nitrogen Solution	5	0	0
90 lbs. 45% N. Urea	2	0	0
300 lbs. 20.5% N. Sul. of Ammonia	3	0	0
330 lbs. 62% K_2O Muriate of Potash	0	0	10
2000 lbs. Total Analysis	**10**	**10**	**10**

When the farmer buys this product, he obtains free about 620 lbs. of calcium sulphate and about 78 lbs. additional sulphur from the ammonium sulphate. Both the soluble calcium and the soluble sulphate are essential plant foods which would need to be purchased by farmers in the humid areas of the U. S. if they were not furnished free in superphosphate.

By contrast, note approximately how a 14-14-14 would

be made under the proposed N-P-K plan:

		% N	% P	% K
1400 lbs. 20% N–53% P_2O_5 Di-Am.Phos.		14	14	0
545 lbs. 62% K_2O Muriate of Potash		0	0	14
55 lbs. conditioner or sand		0	0	0
2000 lbs.	**Total Analysis**	14	14	14

This product would contain no calcium and no sulphur and the N-P-K would each be 100% water soluble. In composition it would be similar to the German Nitrophoska fertilizers which were imported into the Atlantic Coast states in the 1930's and which gave most disappointing results in terms of crop yields.

To a farmer accustomed to a 10-10-10 or a 12-12-12 (on the N-P_2O_5-K_2O basis) a 14-14-14 on the N-P-K basis may not look off balance. It is, however, a 14-33-17 on the oxide basis and a great deviation from the old 1-1-1 ratio.

Most Expensive Form of Phosphorus

Since phosphoric acid, from which ammonium phosphates are made, is by far the highest cost form of P used for fertilizers, averaging nearly twice the cost of P in normal superphosphate, there can be no actual saving to the farmer, to compensate for the loss in gypsum and other nutrients, even when a large saving in freight from a long haul, the lower cost which obtains from fewer bags, and the saving in labor from less bulk handling, are balanced against the higher first cost of the P. Since there is approximately 137 pounds of gypsum in ordinary superphosphate per unit (20 lbs.) of P., in a ton of 14-14-14 (N-P-K) the farmer's loss would be about 1920 lbs. of gypsum.

Would "Junk" Superphosphate

For comparison of costs, we refer to the article by T. P. Mignett, G. C. Hicks, and J. E. Jordan, "Use of Di-ammonium Phosphate in Production of Granular, High-Analysis Fertilizers", Commercial Fertilizer and Plant Food Industry, PP. 24-25, October, 1956–

"Following are the costs at a typical midwestern location of the amounts of concentrated superphosphate and nitrogen solution that are equivalent to 1 ton of di-ammonium phosphate:

21 units N	**0.517 tons N. Sol. (40.6% N)**	**x**	**$57/ton =**	**$29.47**
53.7 units P_2O_5	**1.167 tons CSP (46% P_2O_5)**	**x**	**60/ton =**	**70.02**
			or a total cost of	**$99.49**

"The delivered price of di-ammonium phosphate may be somewhat less than $99.49 per ton in some locations, but it will probably be more than $99.49 in most locations."

Had these authors used 20% P_2O_5 superphosphate in the comparison, the plant food cost equivalent would have been:

21 units N	**0.517 tons N. Sol. (40.6% N)**	**x**	**$57.00/ton =**	**$29.47**
53.7 units P_2O_5	**2.685 tons Superphos. (20% P_2O_5)**	**x**	**17.60/ton =**	**47.26**
			or a total cost of	**$76.73**

This would represent a difference of $22.76 in favor of ammoniated superphosphate. In addition to lower cost, the farmer would obtain without cost, other than transportation and handling, about 1.6 tons of gypsum ($CaSO_4$ $2H_2O$).

The above are some of the obvious reasons for opposing the change. However, there is a more serious danger to the superphosphate industry, and to farmers, in the plan of those who hope to amend the proposed model fertilizer bill by requiring a guarantee of "soluble P" instead of "available P".

Don't Need Soluble P Guarantee

We understand that it is the plan of the group favoring water soluble P guarantee, not to discuss this feature openly until the proper time to introduce the amendment. It seems to be their hope that the change in terminology will slide through the legislature unnoticed.

Presumably it is the further hope of this particular group desiring water soluble P guarantee, that if the first legislatures acting on the so-called model bill do accept the "soluble Phosphorus" amendment, other state legislatures may be more easily induced to approve similar amendments in the interest of uniformity.

It should be realized of course that once the proposed fertilizer bill is introduced into a state legislative body, it is subject to change by the amendments of the various interests who have the political strength to make their wishes stick. Many good legal proposals open up legislative considerations that result in monstrosities not anticipated by the original well-intentioned proponents.

Misleading to Farmer

We are sure that every manufacturer of 20% P_2O_5 superphosphate is aware of the undesirable features of a required, or even a permitted, guarantee of minimum water soluble phosphorus. It would immediately lead the uninformed farmer to believe water solubility to be a desirable property of fertilizer phosphorus. This in turn would induce competing fertilizer salesmen to "sell" phosphorus "solubility" just as they used to "sell" "organic" nitrogen. The natural consequence would be that all fertilizer manufacturers would feel forced to use more water soluble phosphorus than otherwise considered desirable.

There is only one completely water soluble phosphorus fertilizer material that presently can be used in substantial amounts in non-granulated fertilizer mixtures, without destroying desirable physical properties of the mixture. That material is ammonium phosphate (mono- or di-) and, as stated above, it is the most costly of fertilizer phosphorus. It is also considered the least desirable form for the humid soils of the eastern half of the U. S.

Mono-calcium phosphate of superphosphate, an excellent material, is water soluble but it is too hygroscopic and too reactive for satisfactory use in undried mixtures containing the usual nitrogen fertilizer salts and muriate of potash. Also, mixtures of muriate of potash and mono-calcium phosphate destroy fertilizer bags. Consequently, the mono-calcium phosphate of superphosphate must be "neutralized" or changed to the more stable di-calcium phosphate by means of ammoniating media or by other alkaline materials such as lime. This change eliminates water solubility but not desirable availability to crops.

Would Increase Farmers' Cost of N

The fertilizer industry currently uses more than 600,000 tons of nitrogen as ammoniating liquids in "neutralizing" superphosphates, and these liquid forms furnish the lowest cost nitrogen available to the fertilizer industry and consequently to the farmer. In common solid carriers, nitrogen costs from 50 to 100 per cent more than in these low cost ammoniating solutions.

Thus, a legal requirement for a guarantee of water solubility of fertilizer phosphorus would eliminate the full use of ammoniating solutions and raise the farmers' fertilizer costs possibly by $50 million or more per year, including the cost for other needed conditioners when ammoniation is not practiced. Obviously, neither the fertilizer manufacturer nor the farmer will submit to this unwise and costly legal change after the above facts are known.

Need Gypsum from "Super"

As the agronomists and soils specialists of the Carolinas, Georgia, and Florida learned from tests with German Nitrophoska in the 1930's, ammonium phosphate fertilizers do not give good results in the humid soils of the eastern U. S. unless gypsum is added in generous amounts to furnish the calcium and sulphate ions required to give plants balanced nutrition. Gypsum has many desirable functions in humid soils. In addition to supplying available calcium and sulphate ions needed for growth, gypsum is an excellent soil conditioner which is more practical than synthetic conditioners.

Also, when soils are water logged, as often occurs in humid areas, gypsum furnishes oxygen to bacteria growing under anaerobic conditions. However, as bacteria use the oxygen, the sulphur is released to the atmosphere as hydrogen sulphide. This is a means of substantial losses of sulphur and is a reason why annual renewal of calcium sulphate to the soil is desirable.

Consider the major forms of fertilizer phosphorus that will be affected by the proposed law:

a. 20% P_2O_5 superphosphate would be guaranteed as an 8.75% P. This is the lowest cost form of phosphorus. It contains about 60 per cent of gypsum.

This product will be greatly discriminated against by the proposed law, especially so if a guarantee of water soluble is required.

b. 48% P_2O_5 triple superphosphate would be guaranteed as 21% P. This product contains no sulphur.

This product will not be hurt as badly as 20% superphosphate, but will suffer a setback compared to di-ammonium phosphate.

c. 20% N–53% P_2O_5 di-ammonium phosphate would be guaranteed as 20% N–23% P. This product contains no calcium and no sulphur. It is highest in cost of the phosphorus compounds because it is made from phosphoric acid, another costly form. It is entirely soluble.

The proposed change in the law would add tremendously to this product's competitive strength.

d. 64% P_2O_5 calcium meta-phosphate would be guaranteed to contain 28% P. It contains no sulphur and its agronomic worth is still to be proven under varying soil conditions.

This product will be helped by the change from P_2O_5 to P, but not by the water solubility requirement except when treated with sulphuric acid (an additional costly step) in making it suitable for mixed fertilizer use.

Comparison of these materials illustrates how the proposed change in guarantees will make a malproportioned product like di-ammonium phosphate appear to have the balance of a ballet dancer while normal superphosphate will appear to the farmer as low-grade refuse.

Favor Farm Mixing

It should be pointed out further that a big danger from di-ammonium phosphate, to the fertilizer manufacturer, lies in the probability that if ammonia producers shift from production of sulphate of ammonia to production of di-ammonium phosphate, a great proportion of the tonnage would need to be sold direct to farmers, who will combine this with potash to make home-mixed fertilizers.

The potential production of di-ammonium phosphate in the U. S. is very large, and this product, sold either for fertilizer manufacture or for direct use to the soil, may be expected to replace an equivalent tonnage of phosphate as ordinary superphosphate. This in turn would reduce a very large proportion of the lowest cost solution nitrogen now used to ammoniate superphosphate. Every fertilizer manufacturer should study carefully the impact these changes will have upon the profitableness of his mixed fertilizer business over the next decade.

Both of these fish are 18 months old. The small one grew in an unfertilized pond; the large one in a fertilized pond.

700,000 Farm Ponds are a Huge Market for Fertilizers

Every farm pond in your area is a market for mixed fertilizer. These artificial ponds, usually built with the advice of the Soil Conservation Service or the Extension Service, now number over 700,000 in the nation. The needs for water for livestock, soil and water conservation, fire-fighting and irrigation continue to make them popular.

With our expanding population, good natural fishing gets scarcer and more crowded each year. More and more farmers prefer the sport of fishing their own stocked ponds, as recreation for themselves and their families and friends. Fertilizer produces 200 to 500 pounds of fish in ponds of ½-acre to an acre or more in size. Ponds smaller than ¼-acre seldom provide good fishing.

Fish Size Up Faster

Fertilizer booms fishing by providing the essential mineral foods for tiny water plants called plankton. In turn this provides food for insects, small animals and small fish which are food for larger fish. Many states supply fish for stocking such ponds. The most common combination is bluegill bream and bass. Unfertilized ponds seldom provide more than 15 to 40 pounds of fish per year per acre of water surface.

To provide food for the fish, farm pond owners start in early spring by spreading 100 pounds of 2-2-1 or 1-1-1 ratio fertilizer per acre of water surface. Every few weeks another 100 pounds of fertilizer is added–enough to keep the water brownish or greenish in color from the growth of plankton. A common rule is to add fertilizer when you can see your hand clearly as you dip an arm to elbow-depth in the water.

Commercial fertilizer does the best job, according to the experts. Organic fertilizers tend to encourage large algae and other undesirable plant growth. The tiny plants favored by commercial fertilizer not only feed the fish, but also shade out many undesirable pond weeds.

N-dure* Solution Opens Big Spring Market for Specialty Fertilizers

Next Spring there will be a big market for specialty fertilizers containing "enduring nitrogen" for golf courses, lawns, parks, playgrounds, flower and vegetable gardens. It will pay you to plan now to capture a profitable share of this market by manufacturing fertilizers containing N-dure nitrogen.

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Big, new 48-page technical solutions handbook gives full use data.

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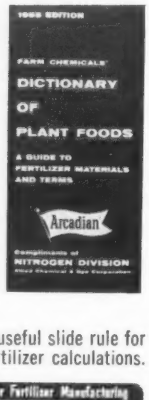

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for any of these useful aids to fertilizer manufacturers shown at the left. Our technical men, skilled in production *know-how* are always on call for customers.

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Chemicals

382—Product Listing

Prentiss Drug and Chemical Co. has available a product listing of all the various formulations of agricultural chemicals, aerosols, household and industrial chemicals which they handle. Your free copy is available if you

CIRCLE 382 ON SERVICE CARD

383—Chemical Analyses

Bulletin No. 3 is now available from Crippen and Erlich Laboratories, Inc., giving complete listings as to types and pricing of various analyses of agricultural chemicals. For your free informative copy

CIRCLE 383 ON SERVICE CARD

384—Perthane

Perthane and its application for the control of moths and in household aerosols is explained in a booklet available from the Rohm & Haas Company. For your copy

CIRCLE 384 ON SERVICE CARD

385—Wetting Agent

Monawet MO-70%, a wetting agent in liquid form which greatly facilitates handling of materials and reduces the processing cycle, is available from Mona Industries, Inc. It is most applicable to fields where fast wetting and penetration are of prime importance. For additional information

CIRCLE 385 ON SERVICE CARD

386—Lignin Sulfonate

Crown Zellerbach Corp. announces the introduction of a new group of surface-active chemicals called ORZAN. A large amount of work has been carried out by agricultural workers to investigate its usage on soils and plants. Evidence indicates that it improves soil structure, water penetration, minimizes wind erosion and adds organic matter to the soil. Complete specifications on the new group of chemicals is available by circling below.

CIRCLE 386 ON SERVICE CARD

387—Vermiculite

A new booklet is available from the Zonolite Co. describing its product, Vermiculite, and its varied uses. The data covered in the book includes physical and chemical properties, and a wide range of uses for this product such as in fertilizers, as a carrier for insecticides, herbicides and fumigants. Formore complete details

CIRCLE 387 ON SERVICE CARD

FREE INFORMATION to help you solve fertilizer, pesticide problems

Reader Service

388—J-M Celite

Johns-Manville now has available a booklet on Celite and its various applications in formulation, as a diluent, and in fertilizers for the prevention of caking and assurance of flowability. For a free booklet on this versatile product

CIRCLE 388 ON SERVICE CARD

How to use the READER SERVICE CARD

- **Circle number of literature you want.**
- **Print or type your name, position, company and address.**
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Process Equipt.

389—Diaphragm Control Valve

A new bulletin on the Cash Standard Type 30 Diaphragm Control Valve has been issued by the manufacturer, A. W. Cash Co.

This type of valve provides accurate pressure reduction and regulation of steam, air, oil, brine and most liquids and gases. Included in the booklet are specifications, sizes and other data. For a copy

CIRCLE 389 ON SERVICE CARD

390—Portable pH Instrument

A new portable, self-contained pH measuring instrument is now available from the Bristol Co. The meter is ideal where a permanently mounted pH recorder is not desired or feasible. The device is capable of covering a pH range of 0–14. Temperature compensation is by means of manual adjustment. Additional free information is available if you

CIRCLE 390 ON SERVICE CARD

391—Explosion Proof Lamp

Light weight and practical lighting is now available from Crouse-Hinds Co. which recently introduced an explosion-proof portable hand lamp ideal for working in flammable areas. Weighing less than 11 pounds, the lamp is UL-approved and has been accepted for class 1, group C locations. For areas where moisture is prevalent a special version of the fixture is available. For additional free information

CIRCLE 391 ON SERVICE CARD

Materials Handling

392—Rubber Gloves

A new complete bulletin on the line of rubber gloves designed for industrial use has recently been made available by the Wilson Rubber Co. The new bulletin features a two-page recommended use table showing the resistance ratings of various Wil-Gard glove materials to 199 chemicals and solvents commonly used in industry. For your copy

CIRCLE 392 ON SERVICE CARD

393—Dispensing Pump

The Multi-Meter Corp. has recently introduced a new dispensing pump designed for standard drums from 15 to 65 gallon capacity. It is said to be able to withstand rusting or corrosion and it is ideal for liquid fertilizers. Each stroke dispenses 4 ounces, providing a measured amount of material. It eliminates old fashioned drum racking and saves floor space. For free information on this product

CIRCLE 393 ON SERVICE CARD

394—Fork Truck

An 8,000 pound capacity fork truck, powered by battery, has been added to the Clark Equipment line of products. It has a turning radius of 85 inches, aisle for right angle stacking of 148½ inches and an overall length of 133 inches. It also has four speeds forward and four for reverse. Free information is available on this fork truck, if you

CIRCLE 394 ON SERVICE CARD

395—Belt Conveyor

The Colson Corp. has available literature on a portable belt conveyor for loading and unloading trucks and freight cars. A 26 foot conveyor expands to 43 feet, with a distributed load of 4000 pounds. Additional free information on these portable conveyors is available if you

CIRCLE 395 ON SERVICE CARD

396—Acid Handling Pump

Dorr-Oliver Inc. announces the availability of a new, two-color, six page bulletin, "The Olivite Acid Handling Pump." The bulletin describes design features, corrosion-resistant materials of construction, applications, sizes and capacities. Included are photographs, cross-sectional drawings, plus power and performance requirement graphs. Free additional information is available if you

CIRCLE 396 ON SERVICE CARD

397—Portable Unloader

Sprout-Waldron has announced the introduction of a new portable unloader which attaches to the outlet of airslide freight cars. This all-weather, portable unloader is of rugged construction with the complete assembly mounted on an aluminum frame, designed to give near perfect balance. One outstanding feature is the variable speed drive which makes possible a mechanical adjustment in the feed rate from the outlet of the airslide car. For more information

CIRCLE 397 ON SERVICE CARD

398—Hand Truck

Sizeable savings in pallet costs can be made with a new hand truck designed by Valley Craft Products, Inc. for the easy tilting of loads as heavy as 1000 pounds. Extremely safe tipping of heavy loads is also claimed, as the frame of the truck is in contact with the load at all times. When the load is tilted to an approximate 45 degree angle it reaches a balance point where the load will actually rest without the operator touching the truck. For an informative copy describing the hand truck

CIRCLE 398 ON SERVICE CARD

Packaging

399—Bagging Scale

Richardson Scale Co. has available a new bulletin describing a new high-speed automatic fertilizer bagging scale, capable of bagging up to 24 sacks per minute. Included in the description of the bagger are features covering design simplicity, automatic operation, dust tight construction and many others. A free copy is available if you

CIRCLE 399 ON SERVICE CARD

How to use the

READER SERVICE CARD

- **Circle number of literature you want**
- **Print or type your name, position, company and address,**
- **Clip and mail the Service Card.**

400—Steel Containers

A complete service as to the right packaging to use and the specifications required for your product is available from the Inland Steel Container Co. Advice as to whether a more attractive container would increase sales is covered, as well as the technical side covering protection of your product during transit. For a more complete story on these services and a free copy of a booklet on the subject just

CIRCLE 400 ON SERVICE CARD

Miscellaneous

401—Electronic Scales

Fairbanks, Morse & Co. has available literature describing the electronic scales which it manufactures. Complete information on the full electronic (load cells replace conventional lever systems), and levetronic (for converting full mechanical scales to electronic weighing and instrumentation, is given. Reportedly weight recording instruments may be located up to 250 ft. from the platform site. For your imformative copy

CIRCLE 401 ON SERVICE CARD

402—Burglar Alarms

An electronic burglar alarm manufactured by the Walter Kidde & Co. is completely described in a booklet giving full particulars. The alarm uses infra-red, modulated light. There are two cone-shaped units: one projects "black" light while the other receives a signal. Anyone passing within 900 ft. through the beam causes the local and central alarm to sound. Your free copy is available if you

CIRCLE 402 ON SERVICE CARD

403—Aerial Applicator

Transland Co. has recently announced the introduction of its Transland Ag-2 airplane, designed specifically for aerial application of agricultural and forest lands. The Ag-2 can safely and economically operate anywhere around the world under adverse conditions—airstrips at high elevations, high temperature, short runways or high obstructions which normally limit the performance and load carrying capacities of conventional aircraft. For additional information

CIRCLE 403 ON SERVICE CARD

404—Vinyl Coatings

A new vinyl maintenance coating has been introduced by Metal & Thermit Corp. which provides corrosion resistance but eliminates strong odors and the need for meticulous surface preparation.

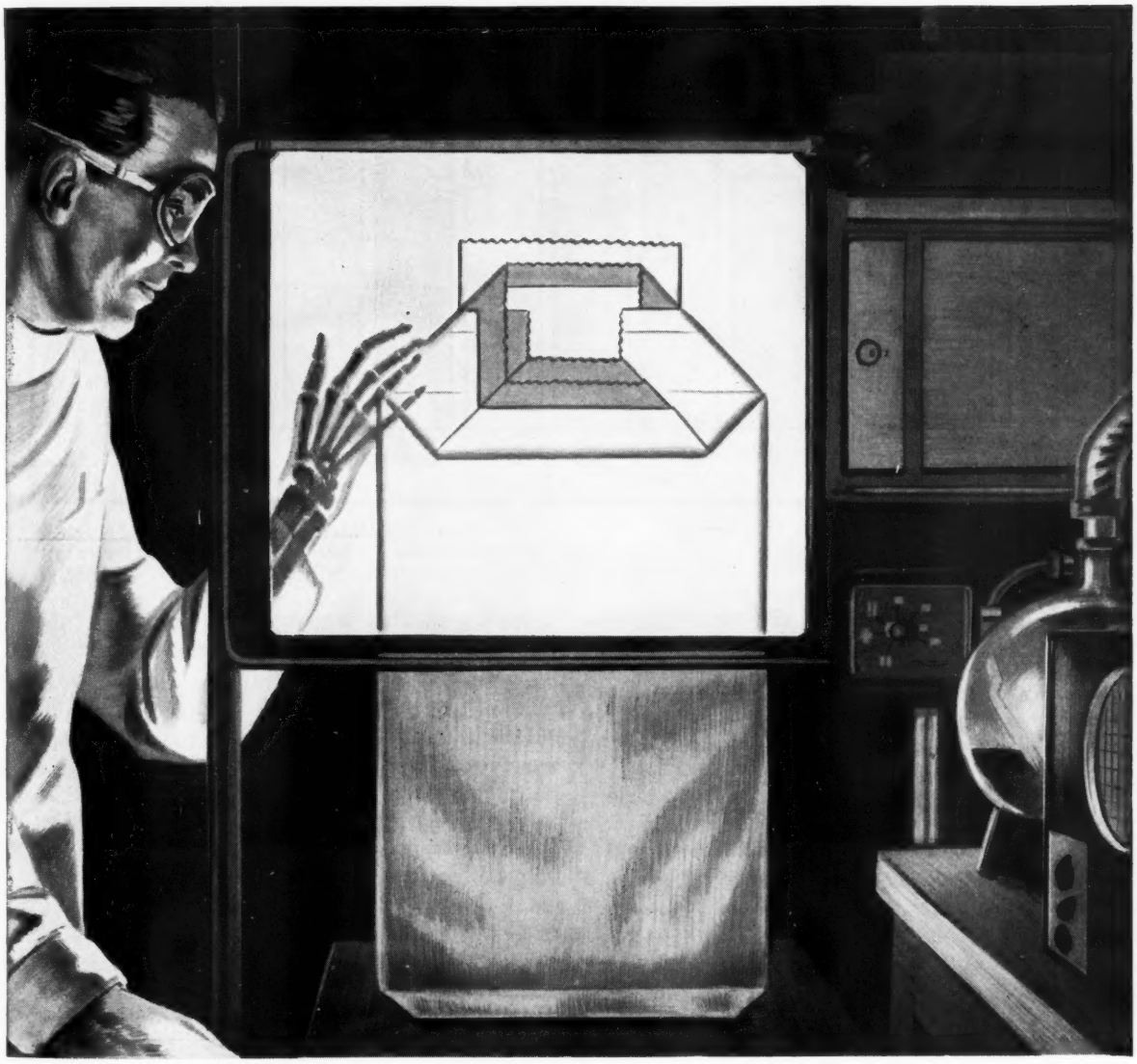
It can be used for walls, floors, ceilings and the exteriors of equipment to resist corrosive fumes in chemical processing plants. The new coating is self-priming and brushes out like oil paint. It has a high flash point and permits application without interference with plant routines. Six colors are available. More free information is available if you

CIRCLE 404 ON SERVICE CARD

See page 57 for information on these Reader Service numbers—

405—Fert. Spreader
406—Fog Nozzle
407—Lighting Unit
408—Gross Weigher

Things you can't see count too!



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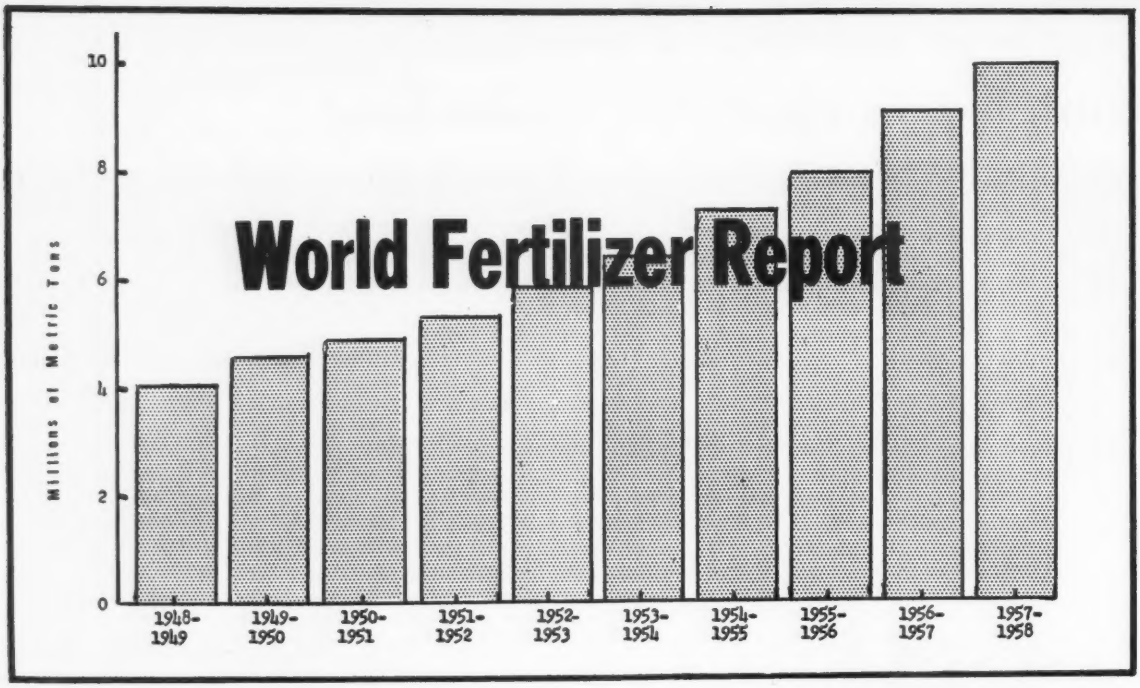


Figure 7. Trends in World Production of Nitrogen (including use for both agriculture and industry).[3]

By Roy L. Donahue

This report, written from data available as of October 1, 1956, is a resume of the world fertilizer situation, including (1) recent trends and developments in production by continents and selected countries, (2) a brief picture of world production of nitrogen, and (3) current production of fertilizers in the United States.

Trends and Developments In World Fertilizer Production

EXCLUDING war periods, world fertilizer production has doubled approximately every 15 years. This is an annual increase of about 6 per cent. In 1955, the increase over 1954 was 9 per cent, exceeding the long-time trend by 50 per cent. Likewise, for the past three years the production has been 21 per cent instead of 18 per cent, which is the long-time average.[1]

Nitrogen has increased in production more than has potash; phosphorus has shown the least increase in production.

The percentages of world supplies of N, P_2O_5 and K_2O produced by each of the six continents are shown in Table 1. Of any continent, Europe produced the largest percentage of all fertilizers, equal to approximately half of the world supply of nitrogen and phosphorus and almost ¾ of the potash.

North America is second, with roughly ⅓ of the nitrogen and phosphorus, and more than ¼ of the potash. No other continent produces potash totaling as much as 1 per cent of the world's supply. Asia produces 13 per cent of the nitrogen and 5 per cent of the phosphorus, while South America is responsible for supplying 5 per cent of the nitrogen and 1 per cent of the phosphorus. Africa and Oceania produce 3 per cent and 8 per cent of the world's phosphorus fertilizer, respectively.

Europe

Recent trends in fertilizer production in Europe are given in Figure 1. Largest increases during the past three years have been in nitrate production, averaging 36 per cent. Next in percentage increase has been phosphorus with 25 per cent, and there has been a 17 per cent increase in potash production during the same three-year period. Actual tonnage production is greatest with potash, whereas nitrogen and phosphorus production have been nearly equal.

Denmark. Superphosphate is produced at three locations in Denmark, totaling 445,000 tons in 1954–55, an amount which supplied 90 per cent of domestic needs. Nitrogen is imported principally as calcium nitrate from Norway. From East and West Germany comes potassium chloride.

Fertilizer consumption was down 6 per cent from the previous year, due to unfavorable weather, lower farm income and a tightening of credit. The outlook for 1955–56, however, is for a 6 per cent increase, following a general long-time trend.[3]

Germany (West). Nitrogenous fertilizer production in 1955 was up 9.6 per cent above 1954, increasing from 696,032 to 763,065 metric tons of N. Phosphate production increased from 490,783 to 524,705 metric tons, a gain of nearly 7 per cent. The production of potash increased the most of any of the fertilizer materials, from 1,483,572 in 1954 to 1,697,207 in 1955, a 14.4 per cent increase.

Total sales in 1955 over 1954 increased 2.7 per cent for nitrogen, 13.8 per cent for phosphate and 3.5 per

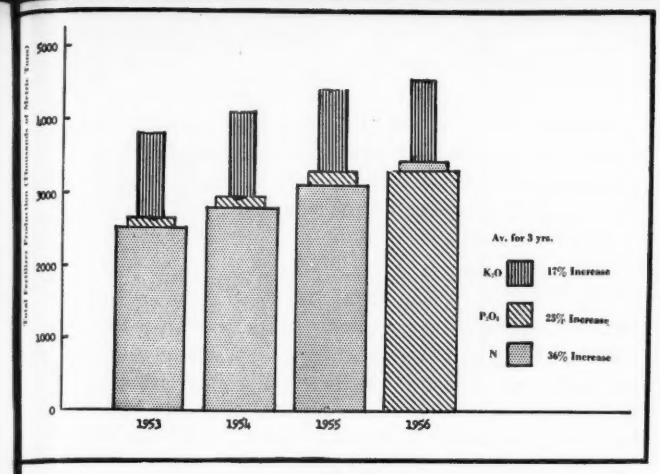


Figure 1. Trend in Fertilizer Production, 1953-56.[8]

cent for potash. Increases in domestic consumption in 1955 were almost identical in percentage to total sales. More rapid increases in production, sales and consumption are predicted for 1956 and ensuing years.[5]

Iceland. A nitrogen fertilizer plant began operations in April, 1954. During 1955, its production was 18,340 metric tons, which was slightly above its rated annual capacity. In its 21 months of operation, Iceland sold 3,913 tons of nitrogenous fertilizers. This income, plus the value of domestically consumed fertilizers, was responsible for the saving of 2.5 million dollars in foreign exchange. Plans are now being made to build a plant for producing superphosphate.[5]

Yugoslavia. A nitrogen plant with an annual capacity of 100,000 metric tons of N is planned for Yugoslavia. Also under consideration are a sulfuric acid plant with a capacity of 20,000 metric tons and a 250,000-ton superphosphate acidulation plant. The present domestic production (1955) of all fertilizers was 203,538 metric tons, a 70 per cent increase over 1954.[8]

Other Countries.[8] In Finland, plans are made to double the capacity of the nitrogen fertilizer plants by the end of 1957. Increases in superphosphate plant capacity are also planned.

Plant capacity to increase their nitrogen production from 70 to 95 thousand metric tons during the next two years is in the immediate plans for the Netherlands.

New nitrogen plants are contemplated for Portugal and Sweden. In Sweden, oil shale gas will be used in the manufacture of 20 thousand metric tons of ammonium nitrate per year.

North America

Phosphorus, nitrogen and potash rank in this order of production in North America (Figure 2). Increases in production, however, rank nitrogen > potash > phosphorus. During the past three years, nitrogen production has increased by one-third, while potash production increased 11 per cent. Phosphorus production decreased 1 per cent over this period, the only decrease of fertilizer material on any continent.

Cuba. During the calendar year 1955, 13 fertilizer mixing plants produced 149,483 metric tons of mixed fertilizer. This is 31 per cent greater than in 1954. All ingredients except some domestic superphosphate were imported, principally from the United States. Aqua ammonia was used experimentally on sugar cane for the first time. The outlook is for greater fertilizer use, primarily on sugar cane, tobacco, rice, potatoes, vegetables and fruits.[6]

Asia

No potash production is reported for Asia (Figure 3). Phosphorus, while produced in smaller quantities than nitrogen, showed a 51 per cent gain over the past three years, whereas nitrogen production gained 29 per cent.

India. The 1955–56 nitrogen requirement for India was estimated at 130 tons of N. Of this amount, 78,000 tons of N will be supplied as ammonium sulfate and the balance will be imported.

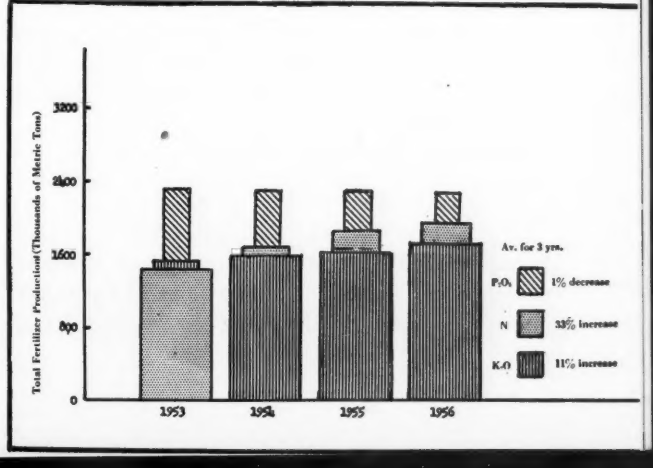
Ammonium nitrate and urea plants will be constructed in the near future. Superphosphate production in India exceeds her domestic demands.[2]

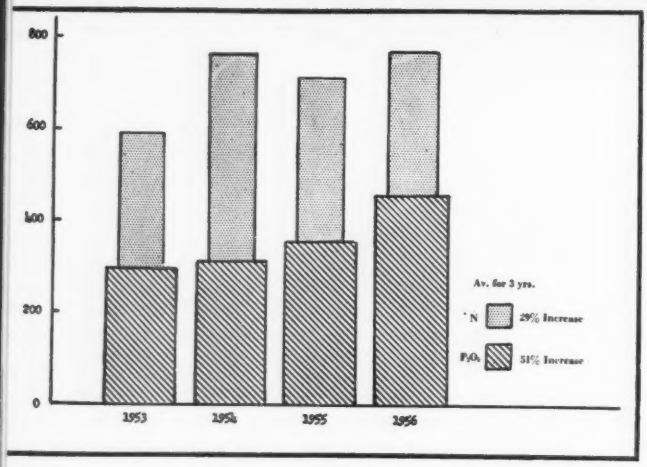
Pakistan. The Pakistan Industrial Development Corporation, a governmental organization, is trying to interest foreign investment in the production of a nitrogen fertilizer plant, using natural gas as a source of hydrogen. The completion of a Pakistan ammonium sulfate plant in July, 1956, is expected to supply only 25 per cent of her domestic needs of 100,000 tons of N.[7]

Taiwan. A new urea plant near Taipei is scheduled for completion by mid-1957. An enlarged ammonium sulfate plant is now in production. A plant producing "nitrochalk" (ammonium nitrate plus lime, 16–20 per cent N) will be in operation in late

North America

Figure 2. Trend in Fertilizer Production, 1953-56.[8]





Asia

Figure 3. Trend in Fertilizer Production, 1953-56.[8] (No potash production reported)

1956. During 1955, domestic fertilizer production totaled 168,000 tons. largely superphosphate and calcium cyanamide.[6]

South America

Figure 4 illustrates that South America produced more nitrogen than phosphorus and more phosphorus than potash. With a 67 per cent increase in production over the past three years, however, potash has shown the greatest step-up in production. Nitrogen production has increased 36 per cent and phosphorus 25 per cent over the same period.

Brazil. The construction of one or more nitrogen plants is planned, using refinery gas as raw material.[2]

Colombia. An ammonia plant, nitric acid plant and plants for the manufacture of urea will be built in Barranca Bermeja, Colombia. An Italian firm was awarded the contract and the completion date is 1959. Waste gas will be used as a source of hydrogen.[3]

El Salvador. Plans have been made to consider the construction of ammonia and urea plants to cost an estimated 13 million dollars, and designed to manufacture 57,500 tons of urea annually.[4]

Africa

Africa produces much more phosphorus fertilizer than nitrogen. No potash production is reported (Figure 5). Nitrogen has increased 78 per cent in production during the past three years, while phosphorus has increased 13 per cent.

French Morocco. Production of rock phosphate during 1955 was 5,328,000 metric tons, while exports totaled 5,280,852 metric tons. Production was 6 per cent ahead of 1954.[5]

Southern Rhodesia. In May of 1956, a new superphosphate plant was started near Salisbury. Sulfuric acid will be made from local pyrites, while rock phosphate for acidulation will be imported from Morocco. Annual capacity of the plant is 70,000 tons of sulfuric acid and 150,000 tons of superphosphate. By late 1957, the plant is expected to begin operation, using imported potash and nitrogen to add to the domestically produced superphosphate in the production of mixed fertilizer. Superphosphate in excess of local needs will be exported to the Union of South Africa.[6]

Union of South Africa. Ammonia and ammonium nitrate plants at Modderfontein, near Johannesburg, manufacture materials primarily for the making of explosives, but small quantities are used for fertilizer. Plant capacities will soon increase. Coke-oven ammonium sulfate will be available from local sources soon. Imports of ammonium sulfate average between 40,000 and 70,000 tons a year.

Rock phosphate is imported from Morocco and acidulated in South Africa. The mining of apatite, a phosphorus ore, was started in August, 1955, at Phalaborwa in Northeastern Transvaal. A low-grade rock phosphate has been mined at Langebaan for approximately 10 years and used directly as a fertilizer. Average annual consumption of this rock phosphate has been nearly 100,000 tons.[5]

Oceania

Phosphorus production is fairly high in Oceania and has increased 28 per cent from 1953 to 1956. Nitrogen is produced in much smaller quantities, but production is up by 11 per cent for the same period. No potash production has been reported (Figure 6).

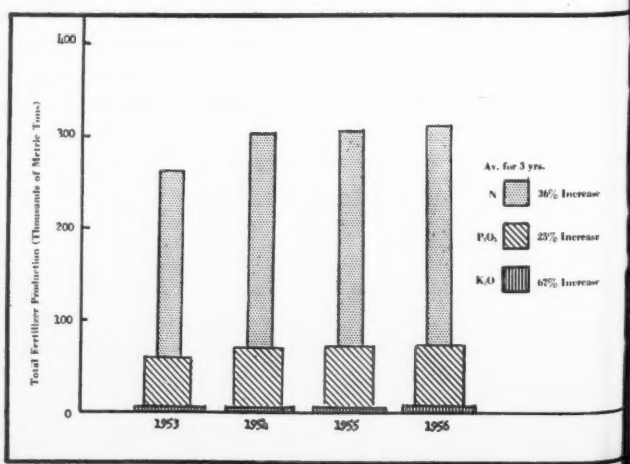
Trends in World Production of Nitrogen

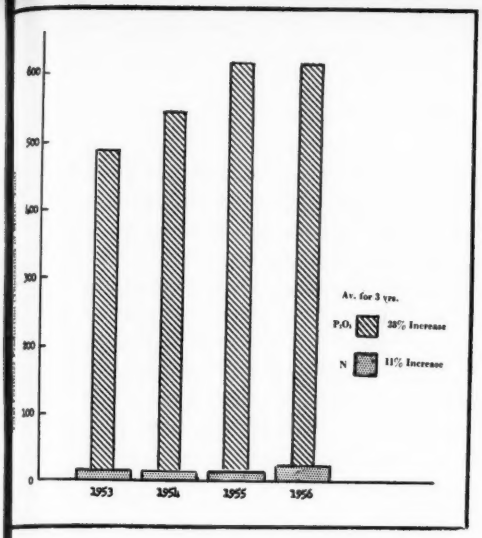
Trends in world production of nitrogen for use by both agriculture and industry for the 10-year period 1949–1958 are shown in Figure 7. Starting with 4,010,000 metric tons of N in 1948–49, production has increased by approximately ½ million tons yearly to 1955–56. Estimated production from 1955–56 to 1957–58 is scheduled to increase an average of 1 million tons a year, to a total of 9,855,000 in 1957–58.

The ratio of nitrogen fertilizer produced for agri-

South America

Figure 4. Trend in Fertilizer Production, 1953-56.[8]





Oceania

Figure 6. Trend in Fertilizer Production, 1953-1956. (No potash production reported)[8]

Table 1. Percentage of World Fertilizer Supplies Produced by Each of the Six Continents in 1954[8]

Continent	Percentage of World Supplies		
	Nitrogen (N)	Phosphorus (P_2O_5)	Potash (K_2O)
Europe	51	46	72
North America	31	37	28
Asia	13	5	X
South America	5	1	X
Africa	X	3	X
Oceania	X	8	X
Total	100	100	100

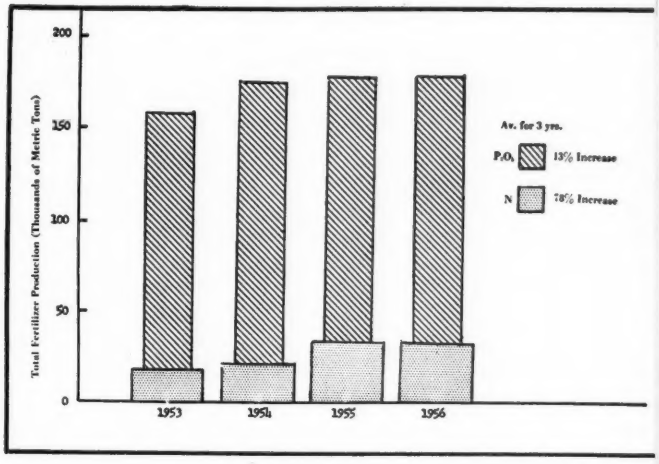
X = less than 1%

culture and that produced for industry has not fluctuated widely. In 1948–49, industry was scheduled to use 16.6 per cent of all nitrogen produced, the smallest percentage for the 10-year period. The largest percentage of N used by industry was 20.5 in 1954–55.

Current Fertilizer Production In the United States

As of January 1, 1956, the United States' plant capacity to produce synthetic ammonia was 3,353,000 tons of N. Other plants scheduled for completion will raise this capacity to 3,900,000 tons of N as of January 1, 1957. Actual U. S. production of N for the calendar year 1955 was 2,601,918 tons.

The production of fertilizers in the United States and its possessions for the fertilizer year 1955–56 in short tons is shown in Figure 8. Nitrogen production totaled 2,241,000 tons of N, phosphorus 2,482,000 tons of P_2O_5 and potash 1,913,000 tons of K_2O



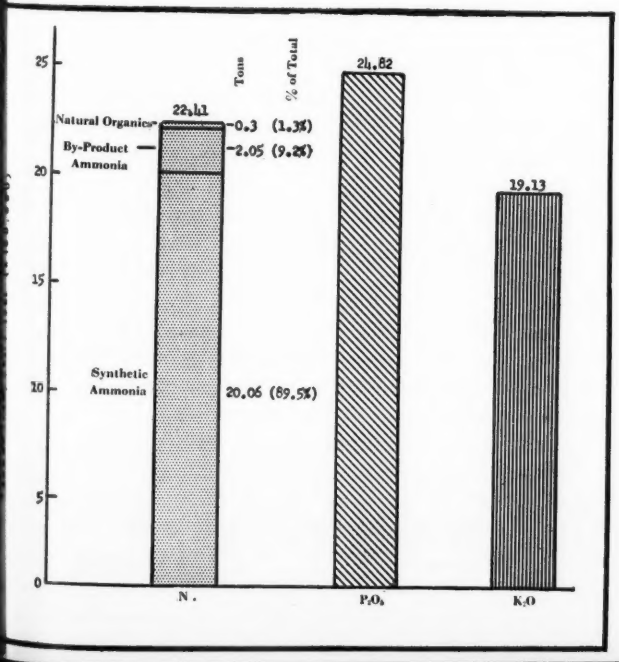
Africa

Figure 5. Trend in Fertilizer Production, 1953-56.[8] (No potash production reported)

equivalent. Of the 2,241,000 tons of N produced, synthetic ammonia accounted for 89.5 per cent, by-product ammonia 9.2 per cent, and natural organics, 1.3 per cent. ▲

United States

Figure 8. Fertilizer Production Estimates for 1955-56, Continental United States & Possessions.[10]



[1] In trying to bring this report up to date, the author wrote to the Food and Agriculture Organization of the United Nations, Rome, Italy, and received in part the following reply, "... it would be about two months before we could have anything worthwhile for you on the past year." ... "From the figures coming in from various countries for the past year, it would be fairly true to say that the trends as shown in the last year's Review seem to be more or less following the same pattern this year." From a personal letter by Pierce Ryan, FAO, United Nations, Rome, Italy, Sept. 27, 1956.

[2] "Chemical and Rubber," December, 1955.

[3] ———, March, 1956.

[4] ———, May, 1956.

———, June, 1956.

[5] ———, July, 1956.

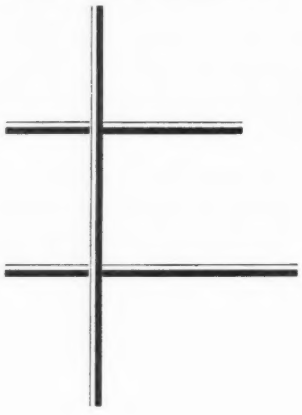
[7] ———, August, 1956.

[8] An Annual Review of World Production and Consumption of Fertilizers. Food and Agriculture Organization of the United Nations, Rome, Italy, November, 1955.

[9] Aikman (London) Ltd. Half-yearly Report on the Nitrogen Industry. May 18, 1956.

[10] "The Fertilizer Situation for 1955–56, Supplemental Report. April, 1956." U. S. Dept. of Agriculture.

CANADA:



Potential G

Farm CH

By D. K. Jackson

Market Research Manager
Monsanto Canada Ltd.

OVER the next five to six years, sales of agricultural chemicals will double. In 1961, our industry volume will be 47 million dollars a year as compared to figures just released which show our 1955 sales at 22.8 million dollars.

This prediction is no flight of fancy, but a rather conservative projection of past trends in sales of pest control products in Canada. It assumes a rate of growth about the same as in the past, no major economic upheavals, and a modest number of new products or new uses. In fact, any major technological break-through will invalidate these forecasts. They would be too low!

Nevertheless, I have prepared projections for each of the major classes of pest control products, each carefully hedged with a statement of how dangerous it is to go this far out on a limb. Statisticians call this the degree of variability of the forecast. Bear in mind, too, that any numbers I quote for the future are only the "most probable" values. This means we will probably be above them half the time and below the other half. The accompanying chart is a logarithmic growth chart. The vertical scale is compressed to the point that an equal percentage increase from one year to the next comes out as a straight line, not an ascending curve.

Now with that preamble let's set the scene for agricultural chemicals.

The backdrop is Canada, a lusty youngster among the nations with lots of wide-open spaces—fertile land for growth. Canada's gross national product, the total output of goods and services, is now 28.3 billion dollars/year and has grown at a rate of 9 per cent per year. It has doubled in the past eight years. This is a greater rate of growth than United States, Great Britain or almost any other country.

The honored patron of our show is the agricultural industry. In 1955, he made gross sales of 3 billion dollars which, after deducting his operating expenses of 1.5 billion dollars, left him a net farm income of about the same (actually $1,454,268,000). Only net income counts for the gross national product and agriculture's contribution to it was 5¼ per cent of the total. Farming is big business.

In 1955, agriculture purchased about 18½ million dollars of our 22.8 million dollar sales. On top of this, the farmer spent more on labor and machinery to apply the chemicals. He does this because experience has shown that this expense comes back many times over by increasing yields and thus increasing sales of agricultural products, or by reducing his labor and other operating expenses. Either way, he increases his net income.

Farmers also purchased 52.6 million dollars worth of fertilizer for the same reasons.

Even at that, only about 3.4 per cent of the farmer's gross income is spent to buy pest control chemicals and only 1½ per cent for fertilizers.

These amounts are very small when considered in relation to the return of an investment in pest control. But more of that later.

The hero of our drama is the pest control products industry, or perhaps I had better say heroes, because we have insecticides, fungicides, seed treatments, livestock treatments, rodenticides and herbicides.

These doughty fighters vanquish an army of villains. As fast as they drag a new resistant species on stage, we bring up a new offensive weapon. These changing reinforcements are the reasons why I am going to give you my forecasts in terms of functional use groups rather than try to say which insecticide, which fungicides or which herbicide will be used.

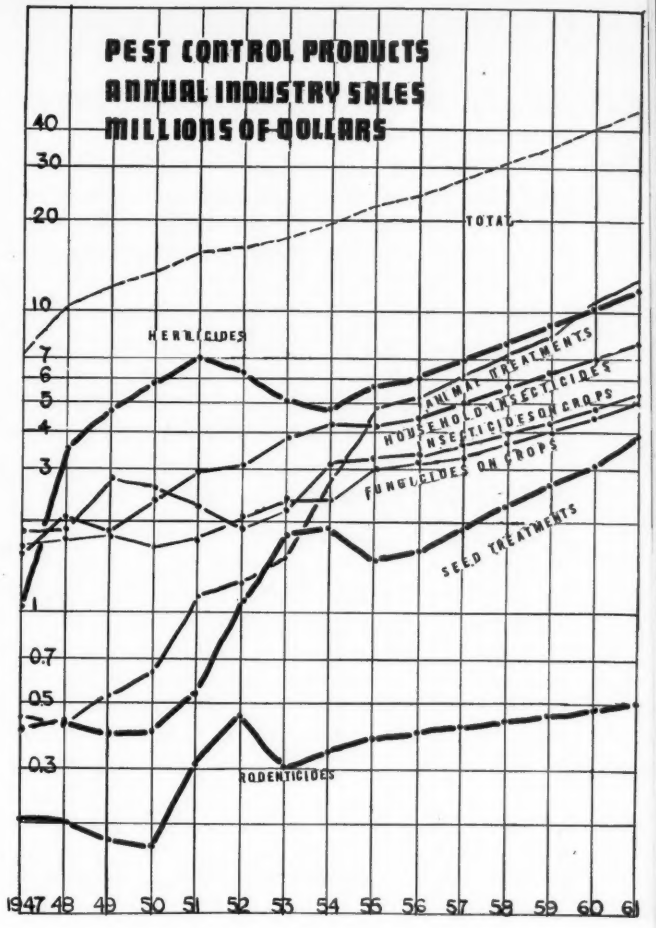
Ring up the curtain on insecticides. By classifying mixed insecticide fungicides according to their major ingredient, I have made a division of agricultural dusts and sprays into insecticides and fungicides.

The use of insecticides on crops is pretty well accepted. In some cases, such as codling moth on apples, over 90 per cent of the acreage is sprayed. Yet, better control on other crops is possible, and the $3.3 million sales of insecticides will increase to $5.3 million.

DDT has been with us since the early 1940's and is still the largest item accounting for ($806,222 in 1955) 24.4 per cent of agricultural insecticides. Malathion has had a rapid rise since 1953 and is now second ($779,843 in 1955) with 23.5 per cent. The other organics—aldrin, lindane, chlordane and dinitro's—arsenicals and rotenone are other large items.

Notice the peak in 1949 which was in large part due to half a million dollars worth ($501,804) of chlordane needed to fight a grasshopper plague.

While we're on the subject, let's look at household and industrial insecticides. These have a similar



al Giant of The m Chemicals Field

growth pattern with less variability due to the very large number of customers and users. These will grow steadily from the present 4.1 million to over 7 million dollars/year. The emphasis is on those insecticides both safe and convenient for use under any circumstances. DDT has between 15 and 20 per cent of this market with malathion and lindane becoming important. The biggest worry of the housewife is moths, for paradichlorobenzene as a control agent was ($1,283,728) 31 per cent of household sales.

Fungicides are used to a certain extent industrially, but judging by the farmer's use of them fungi and related organisms are very bad actors and are becoming more of a problem rather than less. I anticipate fungicides on crops will surpass $5 million worth by 1961. Copper and sulfur sprays continue to be large volume with mercury, dithiocarbamates and new organics growing rapidly.

Seed treatments are mainly fungicidal, although we are considering them separately. Seed treatment is excellent insurance against the loss of all or part of a crop by damping off, by rot, by rust or smut. The out of pocket cost of protecting an acre is very modest. That this is recognized is obvious from the way use of seed treatments is growing faster than some other pest control products.

Now here's a valiant that's really been skyrocketing—animal treatments. Since 1948, it has been growing faster than any other segment of pest control products and it probably will continue to do so. Notice the wide degree of variability I indicate, partly because I have chosen a slower trend for the future years reaching only 12 million dollars in 1961 paralleling the pre-1953 trend.

Livestock Treatments

If you examine the livestock treatments more closely, it becomes evident that the rapid growth of the last three years is due to the inclusion of medicated feeds for coccidiosis. In 1955, these were over 3 million dollars ($3,193,622) accounting for 67 per cent of livestock treatments. The actual therapeutic content of the wormer is much less and our figures are in a sense inflated by the value of the feed portion borrowed from the feeds industry. Mind you, it won't be missed there, for Canada produces 200

million dollars of prepared feeds, neglecting all grain feed directly.

With this, I leave you to solve the dilemma, shall we forecast to sell more grain with our wormers, or will we be satisfied with the old pattern of wormers, blacknead treatments, warble and other livestock sprays?

Rodenticides have stabilized since warfarin came along and captured two-thirds of the market. These are expected to grow steadily to half a million dollars having a decided positive correlation with the spread of the rat population through Canada.

Herbicide Sales Encouraging

Herbicides, a star performer of the industry, gains perspective if we look at a 25 year period. It vividly demonstrates the technological improvement factor that must be considered in any prognostigation of the future. In the years 1937 to 1946, we used sodium chlorate, borax, sulphuric and copper sulfate as herbicides. If one were to project the trend of that decade, he would arrive at a mere $470,000 instead of the $4,720,000 actually sold in the year 1955.

With the introduction of 2,4-D, a new trend was started in 1946–47 which brought us to a peak of over 6 million dollars in 1952, between spraying some 30 per cent of the Prairie acres seeded to grain, several years of declining farm cash income, and some decided price reduction of 2,4-D our dollar sales settled back until this past year. But in 1955, 2,4-D sales picked up again. 1956 should match this performance.

I find justification for optimism in several factors sufficient to project herbicides for 1961 at 12 million dollars.

First, the market for 2,4-D itself is not anywhere near saturation. This is particularly so in the East where many more acres go uncontrolled than are sprayed, where low volatile esters now allow precise spraying, where roadside weed control is increasing in importance, and where 2,4-D with 2,4,5-T is proven economical for brush control on roadsides and rights-of-way.

The second justification for optimism is the new herbicides which control weeds we could not attack before. MCP usage tripled in the past three years. This was mainly because crops like oats, flax and some clovers are more tolerant, and some weeds such as Canada Thistle are more susceptible to it than to 2,4-D.

New weapons that went commercial in the past year or so include CMU, alanap, dalapon and amino-triazole proving useful against the Canada Thistle, quack grass and other weeds.

Actually, several score new herbicides are in the field testing stage by various companies. Some of these are sure to blossom in the next year or two.

My own company, Monsanto Canada Limited, has great hopes for Randox, the new pre-emergence selective grass killer which was described to you at this conference a year ago. It has now hurdled its third field test season and had commercial application this year on corn and soya beans in the United States.

However, judging by controls this season, its greatest promise seems to be for the control of wild oats. Test plots of flax and barley indicate outstanding control (over 95 per cent) with less than four pounds per acre of the active ingredient, chloro-NN-diallyl-acetamide, CDAA for short. Randox is applied at planting or shortly before and is sprayed onto or lightly mixed into the top soil. Row treatment was demonstrated on a crop of sugar beets with equally good results.

The program of field work will be intensified in 1957 and we expect commercial use in Canada will be possible soon. It is too early yet to say how much of an impact this new one will have on our industry herbicide sales curve, but the potential is certainly there.

Now suppose we bring all the actors on stage for the finale. Superimpose the growth curves of these segments of the pest control products industry. Note how they squirm around an average steady growth, and how the ups and downs offset each other to make the total industry sales a rather smooth and steady increase year by year.

This satisfying growth presents a bright future for the industry, and it certainly indicates that pest control pays an economic return to the farmer. If it didn't, these products would have died long ago.

But is the maximum return being obtained from pest control?

Losses Estimated

Dr. A. W. A. Brown in his excellent report published early this year, quotes some rather conservative estimates of losses in 1955 due to uncontrolled

Weeds at	$330 million
Insects at	212 million
Plant diseases at	200 million
Total	$742 million

Imagine if this amount could have been won, and added to the farm net income of that year—$1,454 million—half as much again!

Now we all known 100 per cent control over a large area is either impossible or not justified by the cost of that last few per cent. But where is the optimum? 95 per cent? 50 per cent? 10 per cent?

There is a saw-off point where the increased cash return from sale of the crop plus savings in labor and

SALES OF PEST CONTROL PRODUCTS IN CANADA
(in thousands of dollars)
1947-1955, WITH PROJECTIONS TO 1961.

[1] 1947-1950 adjusted to exclude disinfectants.

Agricultural	1947	1948	1949	1950	1951	1952	1953	1954	1955
Insecticides etc. on crops	2,042	2,073	2,878	2,728	2,347	2,059	2,282	3,249	3,409
Fungicides on crops	1,489	1,598	1,675	1,533	1,619	1,951	2,237	2,245	2,910
Seed Treatments	405	424	393	401	535	1,194	1,808	1,901	1,515
Total Dusts & Sprays	3,936	4,095	4,946	4,662	4,501	5,204	6,327	7,395	7,834
Livestock treatments	449	423	535	624	1,182	1,257	1,587	2,760	4,798
Total	4,385	4,518	5,481	5,286	5,683	6,461	7,914	10,155	12,632
Herbicides	1,046	3,570	4,676	5,763	6,926	6,247	5,198	4,721	5,730
Household & industrial insecticides	1,561	2,025	1,825	2,343	2,872	3,033	3,795	4,133	4,104
Rodenticides	208	202	177	167	319	459	314	347	387
Total Pest Control Products	7,200	10,315	12,159	[1]13,557	15,801	16,200	17,221	19,356	22,853

ESTIMATED FOR FUTURE YEARS
(Probable range: 10 to 20 per cent from figures shown)

Agricultural	1956	1957	1958	1959	1960	1961
Insecticides etc. on crops	3,400	3,600	4,000	4,300	4,800	5,300
Fungicides on crops	3,100	3,300	3,700	4,100	4,500	5,100
Seed treatments	1,600	1,900	2,300	2,700	3,200	3,900
Total Dusts & Sprays	8,100	8,800	10,000	11,500	12,500	14,300
Livestock treatments	5,200	6,400	7,300	8,100	10,700	12,100
Total	13,300	15,200	17,300	19,600	22,200	26,400
Herbicides	6,000	7,000	8,100	9,300	10,600	12,300
Household & industrial insecticides	4,400	5,000	5,600	6,300	7,000	7,800
Rodenticides	400	420	440	460	480	500
Total Pest Control Products	24,100	27,620	31,440	35,660	40,280	47,000

other operating expenses is not greater than the cost of the chemical and its application. This point will vary according to the per acre value of different crops and also according to the cost of controlling the different pests.

In orchard practice control of scab, codling moth and brown rot it is essential to make the crop marketable, and over 90 per cent of infested acreage is sprayed.

Seventy-five to 95 per cent of commercial potato acreage is sprayed against blights and beetles.

All Ontario tobacco acreage is treated for cut worms and wireworms. All cabbage and cauliflower is treated for caterpillars and root maggots.

These examples illustrate that in many cases treatment of the entire crop has proven profitable.

On the other hand, only 30 per cent of Canada's seed grain is treated before planting. With this insurance costing as low as 10 cents per seeded acre, one would feel justified in treating almost all the acreage against the threat of seed-rot, damping off, smut and bunt. I would anticipate that more than 50 per cent of seed will be treated within the next few years, and the potential is still higher.

We can now kill broad leaved weeds with 2,4-D for a dollar an acre's worth of chemicals plus about 80 cents to apply it. At $1.80 per acre, Prairie farmers choose to spray one-third of the grain acreage. A crop like wheat, which returns $36 acre as a Canada-wide average, needs only a 5 per cent yield improvement or saving to make an herbicide pay off. Yield losses over several years have been estimated to be 15 per cent, and in bad areas will run several times this.

At an average pay-off of three to one, farmers should place more bets on herbicides.

Considering insecticides in the home, who will claim he has not lost a good suit to moths, or has not cursed the fly or mosquito that disturbed his slumber. Convenience, comfort and good health are beyond price, and insofar as we contribute to man's welfare in this way, his desire for our products will increase.

I have presented to you the trends in pest control products and presented briefly a few facts to show that we are not yet taking full economic advantage of them.

This is a challenge and an opportunity—A challenge to tell the true and factual story of the pay-off to be won by wise use of insecticides, fungicides, seed treatments, livestock treatments, rodenticides and herbicides—an opportunity for the industry to double its sales of pest control products in the next five years —an opportunity for the farmer to earn three dollars for every dollar he spends on pest control. ▲

MIDDLE WEST SOIL IMPROVEMENT COMMITTEE MEETING

Officers and Directors: Seated, L. E. Quiram, Treas.; R. E. Bennett, Pres.; R. G. Fitzgerald, V. P.; W. M. Newman, retiring Pres. Standing Z. H. Beers, Ex. Sec.; G. H. Kingsbury, ret. Treas.; W. W. Venable, E. T. Potterton, and M. Blue, Directors.

SOME 250 executives and sales personnel, representing the fertilizer industry in the mid-west, attended the 18th annual meeting of the Middle West Soil Improvement Committee at the Hotel Sherman, Chicago, last Oct. 25.

On the program was Assistant Secretary of Agriculture E. L. Butz, who gave his analysis of the Soil Bank program in relation to the fertilizer industry.

During the meeting, reports were also given by various committees as to their progress during the past year. Z. H. Beers, executive secretary, presented a report on the educational program. Beers said that the committee was maintaining its high average on publicity in 1700 daily and weekly newspapers.

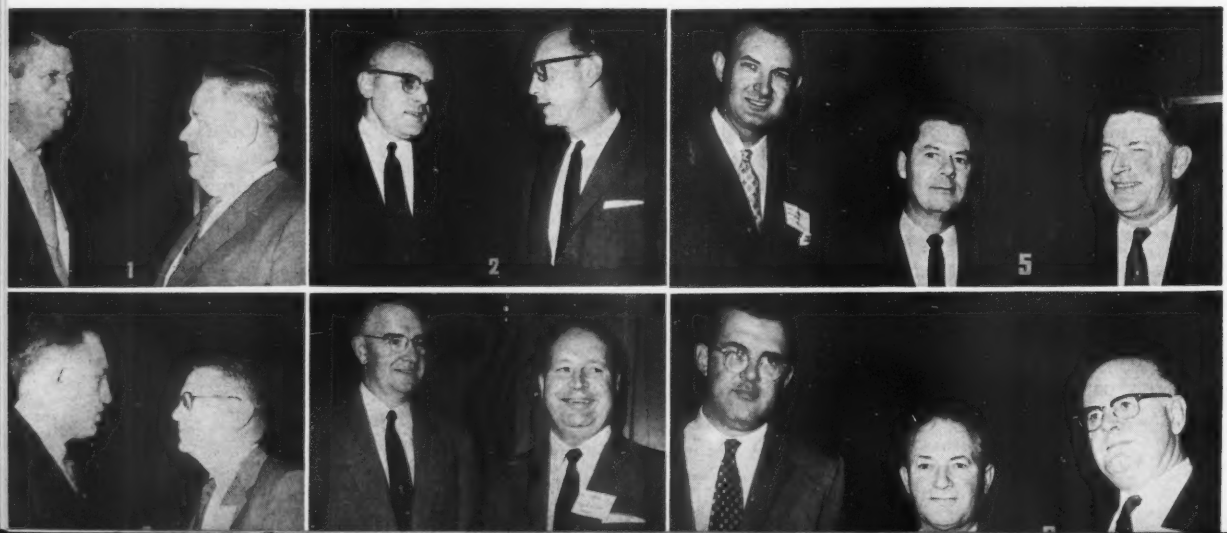
Some 21 articles by MWSIC were published in regional, national and state farm magazines, with a total circulation of four million. In addition, Beers reported that the fertilizer trade press cooperated with the MWSIC by covering meetings and various activities.

MWSIC member companies distributed 200,000 copies of a new folder entitled "Fertilize This Fall—Save Time, Money, Work" to dealers and farmers, as well as to colleges and county agents. In addition, the committee also made available 300,000 copies of a color folder, "Growing Profitable Alfalfa," and 50,000 copies of "Signs That Show on Hungry Legumes."

Turning to the future, Beers cited the need for more educational, public relations and research work to encourage farmers to help build the tonnage of fertilizer applied in the corn belt.

As principal speaker of the meeting, Earl L. Butz

1. E. T. Potterton and J. Zigler, Inter. Min. & Chem. Corp.
2. E. L. Butz, USDA & W. W. Newman, Price Chem. Co.
3. R. Coleman, NPFC, & Werner Nelson, Am. Pot. Inst.
4. H. L. Garrard, API, & Wm. Lehman, Chilean Nit. Sales Corp.
5. John Sanders, Miss. River Chem. Co.; C. H. Fluty, Farm Belt Fert. & Chem. Co., R. White, Spencer Chem. Co.
6. R. D. Tayloe, Nat'l Potash Co.; Cash Cahill, Nat'l. Potash Co.; Niel McClarna, St. Regis Paper Co.



Industry Members At 18th Meeting Hear E. L. Butz Discuss Soil Bank's Effect On Fert. Consumption

Shown here attending the meeting are: Russell Pisle, Sohio Chemical Co.; George C. Kempson, Monsanto Chemical Co.; George W. Cosper, Sohio Chemical Co.

presented a talk entitled "Your Balance in the Soil Bank."

Because "the acreage reserve program reduces acres in basic crops, all of which are relatively heavy fertilizer users, it is inevitable that it will have a negative influence on fertilizer consumption. On the other hand, it is entirely probable that farmers will intensify fertilizer useage on the remaining acres in basic crops as well as on land devoted to other crops."

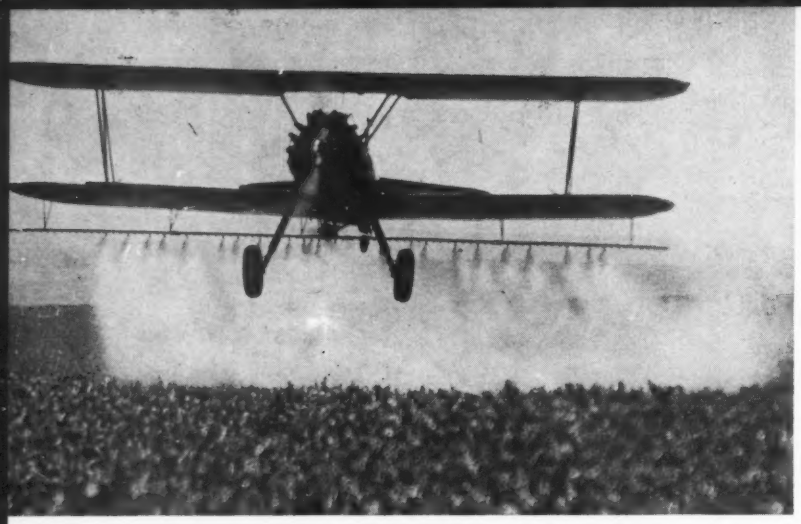
Continuing, Secreatry Butz stated, "The net negative effect of the Acreage Reserve Program on fertilizer consumption might be as little as 400 thousand tons." In covering the effect of the conservation reserve land program he estimated that this would provide a market for 750 thousand tons. "Assuming new seedlings on about 12 million acres of 1957 conservation reserve land, an average rate of 125 pounds of fertilizer per acre might be expected." By balancing out the effects of each program, the net increase for fertilizer amounts to 350,000 tons.

Other items on the agenda included committee reports—Membership, by J. D. Stewart of Federal Chemical Co.; Fertilizer Research Program, by L. E. Quiram, Illinois Farm Supply; Literature and Film Strip, D. A. Williams; and Fertilizer Demonstration, A. R. Mullin, Indiana Farm Supply.

Newly elected officers were as follows: President, R. E. Bennett, Farm Fertilizers, Inc.; Vice President, R. G. Fitzgerald, Smith-Douglass Co., Inc.; and Treasurer, L. E. Quiram, Illinois Farm Supply.

During the afternoon session TV slide set sequences were shown, and a new color film strip by C. E. Trunkey, MWSIC assistant secretary, was previewed. ▲

7. Wendell Hoover, Jr., Ashcraft-Wilkinson Co. & Warren Huff, Ashcraft-Wilkinson Co.
8. R. E. Bennett, Farm Fertilizer, Inc.; E. R. Martin, Miami Fertilizer Co.; John Zigler, Int. Min. & Chem.; James Schell, Kingsbury & Company
9. E. L. Butz, Assistant Secretary of Agriculture, USDA
10. E. R. Martin and Charles F. Martin, Miami Fert. Co.
11. R. W. Wilson, U.S. Pot. Co. & W. B. Copeland, S-D Fert.
12. D. T. Morris and John R. Sargent, Federal Chem. Co.



Insecticide Application

By Dr. J. C. Chamberlin, Ent. and V. D. Young, Agri. Eng.

Agricultural Research Service, USDA
Forest Grove, Oregon

Introduction

This article is developed from information obtained by the Entomology and Agricultural Engineering Branches of the Agricultural Research Service, United States Department of Agriculture, at Forest Grove, Ore., from a jointly conducted cooperative project for the development and improvement of aerial and ground equipment used to apply insecticides and for the development of improved methods of application. The studies were initiated in 1947–48 and have been continued since that date as a joint undertaking in cooperation with the State Agricultural Experiment Stations of Oregon, Washington and Idaho.

In the practical use of any agricultural chemical—insecticidal or otherwise—three essential elements are involved: The chemical itself; the crop, land, disease or pest to be treated; and the mechanism by which the material and subjects are brought into effective contact. Only two of these factors are subject to direct control, these being first the material, and second its application.

The effectiveness of modern agricultural chemicals is, with few exceptions, of a much higher order of efficiency than the available means of application. Furthermore, it seems probable, in spite of foreseeable progress, that this disparity must always exist, especially where large-scale applications of contact-insecticides to widely scattered insect populations are involved. In such cases, even with insecticides possessing great residual properties, most of the material is irrevocably lost through lodging on non-infested surfaces or in crevices where the insect does not occur or is unlikely to wander. In order to reduce these material losses to a minimum, it is important that any applicating device be so designed as to deposit the insecticide as efficiently as possible in the actual microhabitat of the insect in question.

This objective may usually be realized to a large extent in designing and using ground equipment. In contrast, it may be virtually impossible with airborne equipment. In such cases the only feasible objective becomes to distribute the toxic material as evenly as possible across the treated swath with the purpose of avoiding wastefully high deposits in certain areas, and subminimal amounts in others. Within these limits, insecticides must generally be applied from the air at substantially higher than minimal rates in order to increase the chance lodging of adequate amounts within a desired microhabitat.

With these considerations in mind, it is purposed to discuss in general terms some of the principles surrounding the application of insecticides from fixed-wing aircraft with special reference to the control of such insects as the pea weevil and pea aphid on peas and the green peach aphid on potatoes, as well as the use of an experimental ground dust and spray applicator specially designed for control of the green peach aphid on potatoes.

Distribution of Insecticides From Fixed-Wing Aircraft

Our studies have confirmed the idea that the distribution of insecticides from fixed-wing aircraft is essentially a function of the aerodynamic forces or air streams set in motion by the flight of the airplane itself.

The trajectory and ultimate place of deposit of any individual insecticidal particle, whether liquid or solid, is therefore the resultant of the forces imparted to such particle by the forward speed of the airplane, by the air streams coincidentally generated and by the action of gravity. Incidentally, this results in a differential sorting of particles by volume and weight so that coarser and heavier (i.e., less buoyant) particles tend to drop out of the supporting air currents and to reach the ground closer to the point of origin than finer particles which remain suspended longer and follow a more intricate trajectory in arriving at a final, and often more distant, point of rest.

The air currents generated by an airplane in flight constitute an expanding wake of three vortices produced by the propeller slipstream and the two wing-

With Aircraft and Ground Rigs

tips. These are accompanied or modified by secondary, parasitic eddies caused by landing gear, spray and dust distributors and other attachments. The wingtip vortices comprise the most visible and spectacular part of the overall spray curtain and are set in motion by the inboard flow of air from the high pressure area beneath the wings, around the wingtips and into the temporary low pressure area above the wings. This spiraling flow carries the more buoyant spray and dust particles well out beyond the wingtips and back again, perhaps for several revolution, but never outboard beyond the rather definite limits set by the speed of the airplane, by the nature of the air foil and by distortions resulting from impact and flattening of the vortices against the ground at low flight elevations.

The propeller slipstream tends to "trap" spray or dust materials introduced therein. Unless modified by a secondarily induced, parasitic eddies, this prevents such materials being drawn outboard into the wingtip vortices. It also tends to deposit its load distinctly left of the center of the line of flight in a very erratic and non-predictable pattern as a result of the counter clockwise rotation of the propeller. This is especially evident when the sampling area is small and when the flight level is low. In the midwing zone between the periphery of the propeller slipstream and the wingtip vortices there is a short space in which the discharge is relatively little influenced by either vortex. This is evident only in relatively slow and low-powered aircraft, to which category most present-day agricultural airplanes belong.

In larger, faster and more powerful aircraft, this neutral zone becomes vanishingly small and may be disregarded. In such cases spray or dust particles introduced into the tension zone between propeller and wingtip vortices will be caught in both and thereby distributed over the entire potential swath. With slower aircraft, booms or spreaders must extend slightly, at least, beyond the neutral midwing zone and well into the wingtip vortex if maximum swath widths are to be obtained. Since the aerodynamic forces with which we are dealing are extremely powerful, and uncontrollable except by actual aircraft design, about all that can be done is to introduce the solid or liquid particles, in proper proportion, to those points or zones where the major air currents discussed can take over and by their own characteristics determine the distribution pattern.

Factors in Spray Distribution Patterns

The foregoing factors have a special bearing on the problem of specific nozzle spacings for spray applications. Thus with fixed-wing aircraft having an even distribution of nozzles across a full-span underwing boom, the spray deposit rate across the line of flight (or swath) is most streaked or variable for coarsely atomized sprays and for lowest possible flight levels (i.e. with the landing wheels actually marking the treated crop). This variability becomes progressively less as the applicating level increases until at 15 to 25 feet or more it has been reduced pretty much to a minimum. Thus, for high-level applications for the control of forest insects, mosquitoes, grasshoppers and so on, no special nozzle arrangement (other than the usual even spacing) may be required.

The same is also true even at low levels where *very finely* atomized sprays are employed. Indications are that special, corrective (non-symmetrical) nozzle spacings show no particular advantages or disadvantages after the applicating level reaches 15 to 25 feet or more. Below this level, empirically determined, compensated nozzle arrangements have shown substantial advantages with biplanes and low-wing monoplanes where medium or coarse sprays are employed. The need for compensatory nozzle spacings is greatest within the diameter of the circle described by the rotating propeller. With low-powered, high-winged, monoplane aircraft, however, the need for compensatory nozzle spacing is slight, even within the slipstream zone.

Equipment for the discharge of insecticides from aircraft varies with the formulations employed. A spray distributor comprises essentially a tank, pump, power source and boom, the latter provided with more or less evenly spaced openings or nozzles for discharge of spray. The boom may be suspended or hung below or behind the wings, or concealed within the wing.

The only critical feature in the system is that all parts—valves, pump, boom and other plumbing—be of sufficient capacity to discharge the maximum required amounts of spray at points where it may be picked up and distributed in proper proportion by the air currents previously considered. The pump itself may be driven by hydraulic motors powered by the engine itself; more rarely by electric motors or small stationary gas engines, or, most usually, by small windmilling propellers or fans mounted in the slipstream. For an ordinary small plane, the power required is from four to seven or eight horsepower depending on the pressure and the discharge rate. The pump should be capable of delivering between 25 and 100 gallons of spray per minute for most operations.

Factors in the Distribution of Dusts and Granular Materials

The Aerial distribution of dusts or granular materials is, of course, determined by the same forces governing the distribution of sprays. Thus far the dispensation of non-liquid insecticides has been accomplished by gravity flow of the material (with or without mechanical or pneumatic agitation) from a centrally mounted hopper into the throat of an air-scoop mounted within the propeller slipstream. This scoop is provided with diverging ducts extending astern toward the trailing edge of the wing and with the outboard ducts discharging their loads into, or rarely slightly beyond, the periphery of the propeller vortex. This dust distributor or "venturi" induces a secondary vortex at either outboard corner which distorts the normal symmetry of the slipstream and carries the dust or granules farther outboard than would be otherwise possible.

Thus with an N3N or Stearman biplane and a 3½ to 5-foot wide distributor, a 30–35 foot swath is actually obtainable at low flight levels (3 to 6 or 8 feet) because of this fact instead of approximately 15 to 20 feet to be expected from the propeller slipstream alone. If the usual dust distributor is constructed so as to extend the outboard ducts *beyond* the effects of the propeller slipstream (i.e. to a distance outboard substantially greater than the radius of the propeller), a much wider swath is at once obtainable—approximating that obtained with sprays from a full underwing boom—that is about 55 to 60 feet at a 6–8-foot flight level. However, such wide distributors, as commonly constructed, cause a tremendous drag necessitating either dangerously low flight speeds or the use of excessively high engine power.

By thinning out and streamlining such a distributor, however, thus giving it something of the character of a swept-back miniature wing, an experimental distributor with an overall width of more than 14 feet has been constructed and tested. This "wing-like" distributor actually produces some lift and has so little drag that the speed of the airplane is scarcely impaired.

Insecticidal Efficiency of Aerial Applications

Our studies along this line have been limited to tests with a relatively small number of insect pests, principally of peas, potatoes, beans, alfalfa and a few other miscellaneous crops. Notwithstanding the limited nature of our experience, these and other studies suffice to demonstrate that, granted the availability of a suitable insecticide, aerial applications are most effective: (1), against active insects such as the pea weevil, the beet leafhopper or cucumber beetle, the activities or wanderings of which (especially in the case of the residual-type applications) insure effective contact, or (2) against *exposed*, sedentary insects such as the pea aphid, infestations of which are greatest on the tender terminal growth. They have largely failed where deep canopy penetration and good underleaf coverage (especially of the lower leaves) are required as with the green peach aphid on potatoes, the black bean aphid on pole beans, or the two-spotted spider mite on hops.

It is to be recognized that relatively little direct control can be maintained over insecticidal dusts or sprays applied by aircraft once the discharge has been effected. They are literally carried to their destination on the wings of the wind and are therefore subject to its every caprice. Uncontrollable drift on both horizontal and rising air currents is therefore an especially important limiting factor in aerial application.

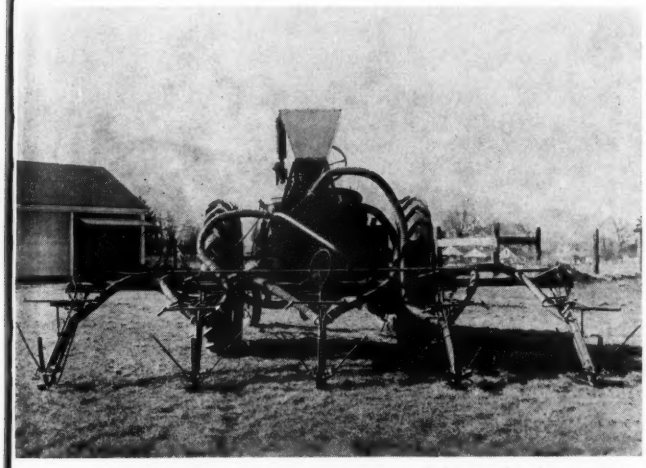
Low flight elevations; minimal wind velocities; maximum effective particle sizes (dry or liquid); and cool ground surface temperatures, with consequent lack of rising air currents are among the most important indirect methods of obtaining satisfactory insecticidal deposits. The use of extremely low flight levels and near-stalling plane speeds to obtain maximum agitation of foliage and consequent better coverage is not only a dangerous practice but a largely ineffective one as well, principally because such flights do not actually displace the "dead air" beneath the foliage canopy. As a result the insecticide-laden air currents are unable effectively to penetrate to the desired places and hence deposits are largely dependent upon a purely gravitational fall-out. In other words, the superficial agitation of the exposed leaves by the slipstream does not significantly improve foliage penetration or coverage of the undersurfaces of leaves except possibly at the top canopy level. Where canopy penetration but not coincident *underleaf* coverage is the principal requisite, sprays have been found to give better results than dusts.

This is almost surely because of the greater mass and inertia of the spray droplets as compared to the very fine and buoyant dust particles.

Since the insecticide-laden air cannot be specially diverted to desired portions of the treated swath, weeds, non-hosts and bare ground are treated equally with the infested crop plants, resulting in undue wastage of material, especially in the case of row crops. Consequently, as earlier noted, for any given insecticide, applications with aircraft must nearly always be substantially higher than with well-designed ground equipment.

Considerations in Design of Specialized Ground Applicating Equipment

This highly diversified field is largely beyond the scope of the present discussion. Unlike aircraft, surface equipment may be designed with the special characteristics of the crop as well as a specific insect pest and its microhabitat in mind.



Combination row crop sprayer and duster having outlets for delivery of insecticides from both underneath and above the plant canopy. Trailing booms follow the furrows and are hydraulically lifted above crop when making turns.

As an example, we experienced outright failure to control the green peach aphid on potatoes with some of our most potent insecticides applied with aircraft at highly excessive rates. Thus malathion spray at 9.6 lbs. of active ingredient per acre, gave only poor control (about 70 per cent), while parathion dust at a net rate of 1.1 lbs. per acre and diazinon dust at 2.2 lbs. active ingredient per acre failed to give any control whatever. However, with a specially constructed experimental ground dusting and spraying unit built with the cultural conditions and growth habit of the potato, and the specific location of maximum aphid infestations in mind, we obtained excellent control with the same materials at half or less the rates which failed completely with aerial applications.

The essential consideration in the design of this equipment was to direct the dust or spray as the case may be, laterally and upward from a point only two or three inches above the soil surface of the furrows between the potato hills so that the initial impact of the insecticide is to the undersurfaces of the leaves on the lower story of the plant canopy or to the actual microhabitat of the insect in question. With this type of ground application, the function of the plant canopy is that of a tent confining and restraining the dissipation of the insecticide. This is in strong contrast to its role in aerial applications where it serves rather as a protective umbrella to the insect in question.

The equipment itself comprised five free-floating, trailing booms each provided with a skid supporting the necessary spray nozzles and dust orifices. The entire unit was mounted on a four-wheel tractor. Except in actual operation the trailing booms are elevated with a hydraulic lift. With this equipment drift is reduced to an absolute minimum although, even so, a short canvas trailer proved advantageous in the case of dust applications when the vines were relatively small. When vines were large, however, the canvas trailer proved unnecessary, and even in winds of 8–10 miles per hour or more, no significant loss of dust or spray from drift was observed.

Conclusion

In conclusion, it may be pointed out that future applicating equipment, whether ground or airborne, may be expected to show not only increased improvements but increased diversification as well, in response to specialized needs. No informed worker or thinker expects the ultimate development of a "universal insecticide" which will destroy all insects in all situations. Neither should he expect a single universally useful method of mechanism for the application of such materials.

Contrary to the opinion of some operators, aerial and ground applicating methods are no more mutually antagonistic than is the saw and the hammer. Rather, they are both useful and complementary in nature. It is the duty of future workers to explore and develop the potentialities and limitations of each with respect to individual requirements. In other words, progress in this field, as in any other, may be expected to result in increasing specialization and differentiation of our applicating tools, whether ground or airborne, in response to specific needs. Finally, since the nature and physical properties of an insecticidal formulation are basic to the design of an efficient dispersal mechanism, the manufacturer and formulator of insecticides should work even more closely than in the past with the engineer, the entomologist, and the applicator if the requirements of agriculture are to be most advantageously served. ▲

Presented at the Tenth International Congress of Entomology, Montreal, Canada.

1956 Index

to authors and articles appearing in Farm Chemicals January-December, 1956

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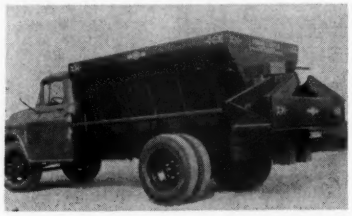
Equipment & Supplies

A & D Heavy Duty Fertilizer Spreader

Adams & Doyle Equipment Mfg. Co. says its heavy duty fertilizer, lime or phosphate spreader is the only one on the market that offers precision built gear



cases of hardened steel, with individually cut and spiral matched gears.

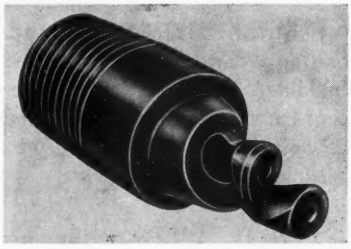
The 21″ bottom, plus correctly engineered ratios permits an even spread of material in any amount from 100 pounds to 4 tons per acre. The spreader has single or double fan units which can be interchanged in minutes. The fertilizer hood is 20 feet wide with open ends for extra coverage. Hood folds to less than 8 feet for highway travel.

For specifications and price sheets,

Circle 405 on Service Card

Hard Rubber Fog Nozzles from Bete

A new line of hard rubber fog nozzles is being marketed by Bete



Fog Nozzle, Inc. Claimed to be non-clogging, corrosion resistant with almost any spray, long wearing and inexpensive, the nozzles are said to be ideal for use where corrosive conditions make the use of metal impractical. For further information

Circle 406 on Service Card

Auto. Emergency Lighting Unit

General Scientific Equipment Co.'s automatic emergency lighting unit assures instantaneous light when regular power fails, reports the manufacturer. Without touching a switch, light instantly illuminates the room if regular power fails.

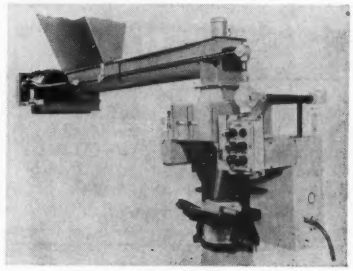
Powered by a storage battery built into the portable set, the unit has sealed beam lights of 100 C.P. and will provide continuous light for 10 hours. For complete information

Circle 407 on Service Card

Gross Weigher for Adhesive Materials

Richardson Scale Co. says its newly designed gross weigher provides automatic, distortion-free weighing of difficult adhesive materials. Automatic features of the scale include push-button control, automatic feed and bin level switches and a choice of power feed mechanisms.

Called the E-52, the scale feeds directly into a bag suspended from the weigh beam, rather than through a weigh hopper. This keeps material continuously in motion until it falls into the bag, eliminating material buildup



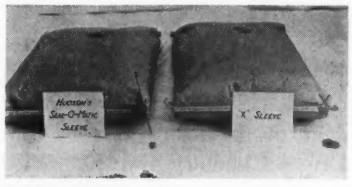
and erratic discharge, Richardson reports. For further details

Circle 408 on Service Card

Seal-O-Matic Sleeve Developed

The Seal-O-Matic Sleeve, an automatic valve closure which is said to virtually eliminate sifting in multiwall bags, has been developed by Hudson Pulp & Paper Corp. for exclusive use in its sewn-valve multiwall sacks.

"Our new sleeve is vitally important to manufacturers and processors of pellet, crystal, pulverized and granular products," said B. C. Drum, sales manager of the firm's Multiwall Div. "Their annual losses through sifting run into virtually thousands of dollars."



Pencil points to the total amount of material lost through sifting during the loading process.

CLASSIFIED ADVERTISING

NEW RATES . . .
Help wanted, positions wanted, used machinery and business opportunities are now charged at only 10 cents per word, $2.00 minimum. Count box number as five words.

Display ads . . . $15.00 per column inch, minimum of one inch. Ads over the minimum are accepted only in multiples of one half inch.

For prompt results, send your classified ads to Farm Chemicals, 317 N. Broad St., Philadelphia 7, Pa.

Closing date: 10th of preceding month

FOR SALE

FOR SALE: 3—Sprout Waldron size 12, style B horizontal ribbon mixers, 336 cu. ft. (10/12,000#) working capacity. Perry Equipment Corp., 1430 N. 6th St., Phila. 22, Pa.

FOR SALE: Aluminum 5 compartment Tanks 2700–3000 gal. formerly used as truck tanks. Oval shape. Perry Equipment Corp., 1430 N. 6th St., Phila. 22, Pa.

HELP WANTED

FERTILIZER SALES REPRESENTATIVE: Man with agronomy background especially adapted to golf course turf and green house growers to travel middle Atlantic states and midwest. Salary, car and expenses allowed. Send educational background and all particulars together with a non-returnable photograph in first letter. Reply to "570", care FARM CHEMICALS, Philadelphia 7, Pa.

WANTED: We are nearing construction completion of our 75% Phosphoric Acid Unit and Ammonium Phosphate soluble pelleted fertilizer plant at Tulsa.

We have unfilled positions open in our credit, secretarial, sales clerical, sales and distribution work.

We are seeking seasoned, experienced people for these jobs.

If interested, please contact Dan Ellis, The Ozark-Mahoning Company, P. O. Box 449, Tulsa 1, Oklahoma.

Suppliers' Briefs

Clark Equipment Co. Robert M. Tobin is named sales manager of the Powrworker Section, Industrial Truck Div. Since joining Clark in 1952 as project engineer, Tobin has served as assistant to the sales manager of the Powrworker Section and as acting sales manager.

Tobin

Continental Can Co. Peter P. Wojtul, vice president in charge of sales, will become vice president of the firm's Fibre Drum Div. on January 1, 1957. With headquarters in Van Wert, Ohio, Wojtul replaces Carl E. Eggerss, who is retiring December 1.

Crucible Steel Co. has acquired the entire interests of National Research Corp. in Vacuum Metals Corp., which now becomes a wholly-owned Crucible subsidiary.

Dorr-Oliver Inc. has appointed Chemical Pulp & Equipment Corp. as exclusive sales representative for its chemical and industrial pumps in the greater New York metropolitan area.

Quentin Cunningham of Pittsburgh and Engineering Corp. of Baltimore have been named sales representatives for D-O industrial and process pumps.

International Paper Co. A new sales service office for the Bagpak Div. has been opened in Camden, Ark. at 121 Jefferson St., S. W. Manager is T. A. McCord. Recently the division also opened regional sales offices in Baltimore, Md.; Chicago, Ill.; New Orleans, La. and Denver, Colo.

Pulverizing Machinery Div., Metals Disintegrating Co. Appointment of Richard A. MacWhorter as sales manager, and promotion of Edburt L. Timm to technical director were recently announced by D. C. Bradley, general manager. The division manufactures pulverizing, pneumatic air conveying and dust collection equipment.

MacWhorter

Timm

St. Regis Paper Co. sales and net income reached new peak levels during the first nine months of 1956, the firm reports. Sales were $247,881,957, compared with $179,612,612 in the comparable period of 1955. After provision for income taxes, net income amounted to $17,124,824, compared with $13,175,434 in the like period of last year.

Schutte Pulverizer Co., Inc. has moved into a newly purchased building with more than 50 per cent increased manufacturing and office area at 878 Bailey Ave., Buffalo 6, N. Y.

Yale & Towne Mfg. Co. Clyde R. Dean, Jr., director of export sales of Yale Materials Handling Div., has been promoted to general sales manager.

Chemicals

Soil Injection Tried For Brush Control

Soil injection is a new method of brush control being tried by the Texas Agricultural Experiment Station, reports DuPont Co.

A soil fumigating gun or similar device is used to inject the chemical into the ground at the base of the plant. One of the herbicidal mixtures which is said to have given good results was six to eight pounds of Karmex W monuron herbicide in 100 gallons of water.

Tob. Budworm Not Resistant To DDT

Although poor control of the tobacco budworm with tractor and rotary-hand dusters has led some growers to believe that the pest has developed resistance to DDT, experiments recently conducted at Florence, S. C., seem to disprove the theory.

A 10-per cent DDT dust, applied directly to tobacco buds with small plunger dusters as soon as young budworms appeared gave excellent protection in tests by USDA and the South Carolina agricultural experiment station.

Researchers report that the dust checked depredations by the budworm even when plants were treated during a heavy wind and despite a 0.3-inch rainfull soon after the DDT was applied.

New Control For Med. Fruit Fly

A new device for the control of Mediterranean fruit fly has been developed by the Israel Institute of Technology. The equipment is designed to make insecticides more effective by means of an evaporator which uses ethylene bromide, and is capable of fumigating 50,000 boxes of fruit per hour. In addition to the evaporator the instrument has an analyzer which can read the effectiveness of the fumigation within a half minute rather than the several hours which is required by normal means.

Glass Frit With Pot. Now Possible

Two workers at the University of California have developed a special glass frit which is capable of furnishing potassium in small amounts to plants for extended periods of time.

Investigation began in order to find a material which would not release potassium in the soil quickly under extremely wet conditions, such as on irrigated crops and ornamentals. With the use of frit, tests indicate that the release rate of potassium is slow under such circumstances.

DDT Enzyme Relation Given

Studies carried out at Rutgers University on DDT enzyme relationships were recently reported, where it was found that the enzyme DDT-dehydrochlorinase was found in high concentration in DDT resistant flies. The same enzyme is also found in DDT resistant Mexican bean beetles. At the present time work is being carried out to determine which organs of insects are responsible for detoxifying DDT.

Other work reported told of an enzyme which was formerly found in wasps, bees and mosquitoes called hyaluronidase, a spreading agent. However this enzyme has also been located in non-venomous insects such as the roach.

Monuron Effective On W. Coast Weeds

Monuron being tested on the west coast indicates that it will save California citrus growers hundreds of thousands of dollars annually on weed control. Two pounds of the material per acre will control weeds from two to eight months, providing the rainfall is of sufficient amount. Monuron not soaked into the soil and left on the surface is not effective.

The effect of the weed killer on mature trees is not dangerous. In field trials amounts up to ten times the normal dosage rate were found to be harmless. However, the material should not be applied to young trees.

Phosphoryl Choline Phosphate Carrier

Phosphoryl choline has been found to be the chemical compound which carries phosphates from the roots to the growing plant. Previously found in animal fats, it serves as an important constituent of nerve sheaths. Never before had the compound been identified in plants.

New Antibiotics Control Mildew

The USDA announced that tests conducted at Beltsville, Md. with two new antibiotics proved most encouraging for the control of powdery mildew on snap beans. One called anisomycin, applied at a rate of 50 parts to a million of water, protected healthy bean plants from powdery mildew and also eradicated the fungus from infected plants. The other called griseofulvin was almost effective.

The antibiotic anisomycin, a product of Chas. Pfizer Co., is produced by the mold *Streptomyces griseolus*, a relative of the organism that yields streptomycin. Griseofulvin is produced by the organism *Penicillin griseofulvin*.

Additional tests indicated that anisomycin protected beans from rust and lima beans from downy-mildew.

by Dr. Melvin Nord

PATENT REVIEWS

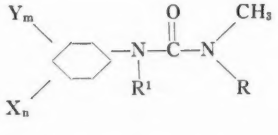
Process for Making Phosphate Fertilizer

U.S. 2,753,252, issued July 3, 1956 to Marion D. Barnes and assigned to Monsanto Chemical Co., describes a process of producing citrate-soluble phosphate fertilizers.

The steps involved in the process may be summarized as follows: (1) acidulating phosphate rock with nitric acid and dehydrating the resulting reaction mixture, (2) treating the mixture with anhydrous ammonia, leaving the desired phosphate product undissolved, and separating from it dissolved calcium nitrate by filtration, and (3) precipitating from this solution the calcium ion as calcium carbonate, by reaction with CO_2 and H_2O, filtering off the calcium carbonate, and leaving an ammonium nitrate solution which may be used in industry.

Three Patents Describe Herbicides

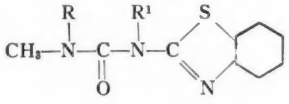
U.S. 2,753,251, issued July 3, 1956 to Henry J. Gerjovich, assigned to E. I. duPont de Nemours & Co., discloses the use of halophenyl-alkyl-ureas as herbicides. The compounds have the general formula



where X is halogen, n is 1,2 or 3, Y is hydrogen or alkyl up to C_4, m is 1 or 2, and R and R^1 are alkyls up to C_8 (totalling at least 4 carbons).

U.S. 2,754,188, issued July 10, 1956 to Howard L. Yowell and John F. McKay, assigned to Esso Research & Engineering Co., describes a derivative of 2,4-D and of 2,4,5-T which does not have "drifting" characteristics. It is produced by reacting either of these compounds with the alcohol still bottoms products of the Oxo reaction.

U.S. 2,756,135 issued July 24, 1956 to Norman E. Searle and assigned to E. I. duPont de Nemours & Co., discloses an herbicide having the general formula



where R is hydrogen or alkyl (up to C_4) and R^1 is hydrogen or methyl.

Concentration of Phosphate Minerals

U.S. 2,753,997, issued July 10, 1956, to James B. Duke and Harvie W. Breathitt, Jr., assigned to Minerals & Chemicals Corp. of America, describes a process for concentrating phosphate minerals, in which a silica froth-product containing some phosphate is produced by a froth-flotation treatment using positive-ion agents.

The improvement consists of deactivating this froth-product in an aqueous pulp with a colloidal clay, and then subjecting it to further froth-flotation treatment with negative-ion agents. The results is a considerable improvement of the recovery of phosphate, without any substantial lowering of the grade of the final phosphate.

Describe Method For Soil Treatment

U.S. 2,754,189, issued July 10, 1956 to Stanford J. Hetzel and assigned to Sun Oil Co., describes a method of promoting the growth of plants, by applying to soil in the form of a dry powder, green sulfonic acid ammonium salts. About 10–100 pounds per acre gives a substantial increase in crop yield.

It is believed that the salts act in two distinct ways: (1) as fertilizers, and (2) as an agent for facilitating utilization of other nutrients by plants, through their wetting action. The salts are obtained from the sulfonation of mineral oil fractions.

Soil Stabilization

U.S. 2,754,623, issued July 17, 1956 to David T. Mowry and Ross M. Hedrick, assigned to Monsanto Chemical Co., describes an improvement in the method of stabilizing soil surface areas with water-soluble acrylic polymers. It has now been found that the method of appreciation is critical, and should consist of spreading the polymer as a fine powder on the soil surface. When the powder becomes wet, it forms a film which binds the soil particles on the surface into a cover structure.

U.S. 2,756,134, issued July 24, 1956 to Leo J. Novak and assigned to The Commonwealth Engineering Co. of Ohio, provides a method of stabilizing soil by synthesizing in it unhydrolyzed dextran. This is accomplished by applying to the soil a dry mixture of cane sugar and Leuconostoc bacteria (or the enzyme produced by the bacterias).

U.S. 2,757,161, issued July 31, 1956 to Charles H. Rector, Jr., and assigned to Monsanto Chemical Co., discloses a method of improving the aggregate stability of soils by incor- (to page 63)

PEST REPORTS

Presented in cooperation with the Economic Insect Survey Section, Plant Pest Control Branch, Agricultural Research Service, USDA.

Spread & New Insect Finds in '56

DURING 1956 insects continued to show their ability to not only spread in this country but to enter from foreign areas. The insect which perhaps received the most publicity and attention during the year was a pest that at one time had been eradicated from this country but has again invaded our land.

The Mediterranean fruit fly, a serious pest of certain fruits and vegetables, which in 1929 was found in central Florida and eradicated by July of the following year at an estimated cost of over $7,000,000, in April of 1956 was found in the Miami, Florida, area.

Immediately upon finding the infestation an intensive Federal-state survey and eradication program was initiated. The pest has now been found in 28 Florida counties but in many of these counties the infestations have been spotty or localized. By the last of October the eradication program had reduced the known infested area from a high of approximately 750,000 acres to approximately 170,000 acres. No Mediterranean fruit flies have been found in this country outside of Florida.

The insect known to be in this country prior to 1956 showing the most spectacular spread was the spotted alfalfa aphid, a very destructive pest of alfalfa. This pest was first found in the United States in 1954 and had invaded 14 states west of the Mississippi River by the end of 1955. The first report of the spotted alfalfa aphid east of the Mississippi was that of a collection from Alachua county, Florida. Mississippi was next to report an infestation. Since then the aphid has been found in Illinois, Wisconsin, Indiana, Kentucky, Tennessee, Alabama, Georgia, South Carolina, North Carolina, Virginia and West Virginia. North of the states known to be infested in 1955 the aphid was found this year in South Dakota, Iowa and Minnesota. Also reported for the first time in several states was the sweet clover aphid.

Although the first collection in this country was made in 1948, during this year the aphid was reported from widely separated states. First reports were received in 1956 from California, Idaho, Illinois, Kentucky, Mississippi, Missouri, New Jersey, New York, North Dakota, Pennsylvania, South Dakota, Texas, Virginia and Wisconsin.

The Mexican fruit fly, a pest of citrus, was taken again in California this year. This insect, which has been in the Rio Grande Valley of Texas for a number of years, was first taken in California in 1954. A program, designed at eradication, was initiated in California and Baja California, Mexico. It was not until May of this year that the fly was again found in California. The eradication program continues and only three flies have been taken this year in California, all within less than two miles of the Mexican Border at Tijuana. Only eleven flies have been taken this year in northern Baja California, Mexico.

The melon fly, a very destructive pest of some vegetables and fruits, was taken in the United States this year but to date survey results have been more encouraging than with some of the other introduced pests. A single specimen of the pest, an insect not known to be established in the Western Hemisphere, was taken in a trap in July on the campus of the University of California at Los Angeles. Extensive scouting and the use of more than 8,000 traps in the area have failed to reveal additional specimens.

New Termite Species

At Houston, Texas, in July a species of termite (*Coptotermes crassus*) was taken from a dry dock and upon examination was found to be a very destructive tropical species not known previously in this country. Continued survey has failed to find additional infestations in the United States and the infested timbers are being removed and burned.

Several other insects were reported in 1956 as having been taken for the first time in the United States. Among these was a bostrichid (*Sinoxylon ceratoniae*) taken in Hollywood, California, from furniture which had been manufactured in Egypt for a movie set and returned to this country for storage. The furniture was fumigated and the infestation destroyed. From Florida came the first record of the leaf footed bug (*Leptoglossus stigma*) in this country. The insect was collected during June in Dade county, from lychee, a nut becoming widely used in the prepa-

ration of certain foods. The first report of the aphid (*Myzaphis bucktoni*) in this country came from Maine where the pest was collected in September from swamp rose. A tortricid (*Acleris lipsiana*) was collected in Oregon cranberry bogs during September for the first United States record of the pest. Food plants of the insect in Europe include *Myrica* and *Vaccinium*.

First Finds in This Country

Several insects heretofore known to be in the United States were reported from additional states in 1956. The yellow margined leaf beetle, a pest primarily of crucifiers, first reported in this country in 1947 from Mobile county, Alabama and prior to this year also known to be in Mississippi and west Florida, was found in Louisiana. California reported finding for the first time the grain beetle (*Pharaxonontha kirschi*). This insect was previously known to be in Texas and Illinois. The Rhodes grass scale, an insect attacking grasses, which has been known to be in Texas and several Southeastern states, was reported from Arizona in August. An eriophid mite (*Vasates masalongoi*) was taken in August in the state of Washington for the first time.

Giant Hornet Found in Tenn.

The giant hornet (*Vespa crabro germana*), which is distributed in most of the Eastern Seaboard states from Massachusetts to South Carolina and west to Ohio, was collected in Tennessee for a new state record. The weevil (*Calomycterus setarius*) was found at Walpole, New Hampshire in August for the first record for the state. The vetch bruchid, a serious pest of vetch, was taken for the first time in Kansas. Previously the pest was known to be in Texas, Oklahoma and Missouri.

Forest insects which established new state records included the smaller European elm bark beetle, found for the first time in New Mexico, the pine gall weevil (*Podapion gallicola*) which was taken in the Auburn, Alabama area for a first record for that state and the willow sawfly (*Nematus ventralis*) which was taken for the first time in Arkansas in the Washington-Benton area. The sawfly (*Arge scapularis*) was reported in Wisconsin for the first time from Pierce county where it was defoliating elms. ▲

Patent Reviews . . .

(*from page 61*) porating small proportions of polyvinyl esters of hydroxy-containing carboxylic acids.

Recovering Fluorine From Phos. Rock

U.S. 2,753,253, issued July 3, 1956 to Clinton A. Hollingsworth and assigned to Smith-Douglass Co., Inc., describes a method for recovering fluorine from phosphate rock.

The process involves (1) increasing the fluorine content of phosphate rock by passing the exhaust gas from the defluorinating calcination of other phosphate rock into contact with the phosphate rock currently being treated, forming solid fluorides which are retained, and (2) recovering the fluorine from the fluorine-enriched phosphate rock by defluorinating calcination.

In U.S. 2,754,191, issued July 10, 1956 to the same inventor and assignee, another improvement in defluorinating calcination processes is described. The granules of the charge are coated with finely divided silica, and the calcination atmosphere contains water vapor. If the composition of the phosphate rock charge is within certain prescribed limits, fusion will thus be avoided during the defluorination calcination.

Statistics

Pesticide Output, Use at Record Levels

Output and consumption of pesticides for the year have been at consumer record levels, particularly for DDT and BHC, according to a U. S. Dept. of Commerce report. Considerable gains also were reported for the newer organic pesticides.

Potash Deliveries Down One Per Cent

Potash delivered for agricultural use in the United States, Canada, Cuba, Puerto Rico and Hawaii during the first nine months of 1956 amounted to 2,446,066 tons of salts (1,439,032 tons K_2O), according to the American Potash Institute. Muriate of potash accounted for 2,222,485 tons, manure salts, 6,870 tons and sulfate of potash and sulfate of potash-magnesia, 216,711 tons. This represents a 1 per cent decrease in salts and K_2O.

Report on Superphos. Industry in 1956-56

The superphosphate industry finished the 1955–56 fertilizer year with stocks 28 per cent above those on hand a year earlier, according to the Department of Commerce.

Concentrated superphosphate accounted for the greatest inventory accumulation, about 70 per cent more more than stocks at the end of the 1954–55 season.

Although total disposition (shipments plus producers' own consumption) of concentrated superphosphate was up about 9 per cent during 1955–56 from the preceding year's level, production increased 14 per cent, the Bureau reported.

Aug. Copper Sulfate Shipments Down

Copper sulfate shipments during August were the smallest of the year, except for January, and dropped 30 per cent from July. Inventories rose 29 per cent, and at the August rate of shipments were sufficient for about 3 weeks needs.

August Stocks & Shipments of Super.

During August, shipments of superphosphate and other phosphatic fertilizers totaled 98,194 tons, a 2 per cent increase over the previous month's volume.

Stocks on hand at the end of the month were about the same as those held on July 31.

The Dept. of Commerce reports that these monthly figures are not adjusted for seasonal variation and number of working days.

State Fertilizer Reports

West Virginia

Users of commercial fertilizers in West Virginia bought 65,465 tons during the first six months of 1956, according to J. T. Johnson, Commissioner of Agriculture.

Compared to the first half of 1955, sales were down 4 per cent. Most of the decrease was in mixed fertilizers—the total of 58,776 tons was 5 per cent less than the tonnage for the same period last year.

Sales of 5-10-10 amounted to about 48 per cent of mixtures sold.

Based on average retail prices farmers were paying around April 15, total cash outlay for fertilizers amounted to approximately $3.4 million during the first half of 1956, compared to $3.6 million during the first half of last year.

Bulk of this money was spent for mixed fertilizers, $3.1 million.

California

During the fiscal year 1955–56, 1,001,554 tons of commercial fertilizers, including materials and dry mixed goods, were reported to the California Dept. of Agriculture.

Four leading grades among the 208,231 tons of mixed fertilizers were 10-10-10, 20,537 tons; 10-10-5, 19,460 tons; 17-7-0, 15,903 tons and 8-8-4, 14,214 tons.

Kentucky

Mixed fertilizer tonnage in Kentucky during 1955–56 was 432,000 tons, an increase of 3 per cent over tonnage sold the previous fertilizer year. Straight materials tonnage of 97,000 reflects a decrease of 7.6 per cent from the previous year.

When averaged together, mixed grades relatively low in plant food content such as 2-12-6, 3-9-6 and 6-8-6 fell off 24 per cent in tonnage, while those of higher analysis such as 4-12-8, 6-12-12, 10-10-10 and 12-12-12 increased an average of 55 per cent in tonnage.

Leading mixed fertilizer is 4-12-8 with 85,000 tons, followed by 5-10-15 with 81,000 tons and 3-12-12, 50,000 tons.

Fertilizer 43% of Mich. Farm Land in '54

About 43 per cent of all Michigan crop and pasture land was fertilized during 1954. Eighty-three per cent of corn and 82 per cent of oat fields were fertilized, while only 8 per cent of hay and cropland pasture and 4 per cent of permanent pasture land were treated with plant food.

Production — August, 1956

Compiled from Government Sources

Chemical	Unit	August 1956	August 1955	July 1956
Ammonia, synth. anhydrous	s. tons	242,584	237,202	248,384
Ammonia liquor, coal & coke (NH_3 content)				
(Including diamm. phosphate & ammon. thiocyanate)	pounds	2,637,706	2,831,300	2,114,312
Ammonium nitrate, fert. grade (100% NH_4NO_3)	s. tons	[1]139,635	121,978	*131,901
Ammonium sulfate				
synthetic (technical)	s. tons	81,576	82,453	81,743
coke oven by-product	pounds	132,631,008	161,097,514	47,424,655
BHC (Hexachlorocyclohexane)	pounds	7,682,872	7,838,836	8,630,525
Gamma Content	pounds	1,322,010	1,302,785	1,435,215
Copper Sulfate (gross)	s. tons	5,964	6,507	6,196
DDT	pounds	12,137,578	11,334,015	11,927,462
2,4-D Acid	pounds	1,447,560	2,795,522	
esters and salts	pounds	625,659	2,587,527	1,916,407
esters and salts (acid equiv.)	pounds	459,730	2,001,968	1,484,060
Lead Arsenic (acid and basic)	s. tons	[2]	[2]	[2]
Phosphoric acid (50% H_3PO_4)	s. tons	258,870	244,502	235,900
Sulfur, Native (Frasch)	l. tons	597,699	500,710	621,130
Recovered	l. tons	42,500	34,900	43,400
Sulfuric acid, gross (100% H_2SO_4)	s. tons	1,181,809	1,202,169	1,129,556
Superphosphate (100% APA)	s. tons	143,146	*136,990	136,584
Normal (100% APA)	s. tons	88,073	98,008	*77,238
Enriched (100% APA)	s. tons	[2]	3,426	[2]
Concentrated (100% APA)	s. tons	40,825	35,223	45,338
Wet Base (100% APA)	s. tons	[2]	333	[2]
Other phos. fertilizers	s. tons	13,142	12,893	13,181
2,4,5-T acid	s. tons	253,758	86,789	489,796
Urea	pounds	62,525,520		51,566,620
Calcium Arsenate	s. tons	1,171	[2]	4,044

* Revised. [1] Includes quantities for 1 plant previously not reporting. [2] Withheld to avoid disclosing figures for individual establishments.

Fertilizer Materials Market

New York

November 20, 1956

Sulfate of Ammonia. Stocks were said to be accumulating because of the belated movement to fertilizer plants but some producers were hopeful that in the next 30 days demand would pick up. While American producers recently bid on some large export inquiries, very little business was actually reported.

Ammonium Nitrate. No price changes were reported in ammonium nitrate with some scattered movement reported in the Midwest.

Urea. Some imported material continues to arrive in this country, but demand at present is limited from the fertilizer trade, with most of the material going to the chemical trade.

Nitrogenous Tankage. This market was still quoted at from $3 to $4 per unit of ammonia ($3.64 to $4.86 per unit N) according to shipping point. Buyers are only buying as they need material and offerings are available at most points.

Castor Pomace. This material was still in short supply with no offerings being made in some time because of the small current production. Latest price was nominally around $37.50 per ton, f.o.b. production point.

Organics. Because of the recent Mideast crisis a little more interest was shown by buyers of organic fertilizer materials. Tankage and blood sold to the feed trade at $5 per unit of ammonia ($6.08 per unit N), f.o.b. Eastern shipping points. Soybean meal advanced to $47.00 per ton in bulk, f.o.b. Decatur, Ill., some mills being sold out for prompt shipment. Linseed meal and cottonseed meal were both firmer in price.

Fish Meal. Offerings of this material were rather small at the moment with most fish factories satisfied to hold stocks on hand for better prices. Last sales of fish meal were made at $135 to $137 per ton, f.o.b. fish factories. No arrivals of imported material were reported on the East Coast.

Bone Meal. This material was on the firm side with last sales made at $60 per ton, f.o.b. production points. Some imported feeding grade was sold at $65 per ton.

Hoof Meal. This market remained nominally at $6 per unit of ammonia ($7.29 per unit N), f.o.b. Chicago, with demand slow both from fertilizer and industrial trade.

Superphosphate. This market was still a routine affair with some better movement reported in certain sections where small fertilizer mixers were starting up operations. No price changes were noted.

Potash. Some producers of this material noticed a little better movement but in many cases shipments were behind last year as buyers held up shipping instructions until the last minute. Some arrivals of foreign potash were reported.

Philadelphia

November 20, 1956

There is practically no activity in the raw materials market. The demand is not up to the production, and consequently inventories are building up. While tankage and blood are considerably lower in price than a month ago, fish scrap is higher. Production of castor pomace is very much reduced. Improvement in the market is not expected for several weeks or more.

Sulfate of Ammonia. Inquiries are extremely scarce and stocks are accumulating. It is reported that recently a lot of well over a quarter of a million tons was sold by Belgian dealers to Red China. The material was supplied by European and Russian producers and the foreign market was accordingly strengthened. Benefit to our own market was lost, due to regulations prohibiting this class of trade.

Ammonium Nitrate. No recent price changes are reported. Stocks are large and demand rather slack. Latest reports indicate a slight decrease in production.

Nitrate of Soda. Sufficient material is in store to meet all requirements, and market is very still. Recently reduced Chilean prices remain at $46 per ton for bulk, and $49.50 in bags.

Blood, Tankage, Bone. Market is very quiet with blood at $5.25 per unit of ammonia ($6.38 per unit N), both in the Chicago area and here in the East. Tankage is listed at $5 per unit ($6.08 per unit N), in both Chicago and

New York areas. Bone meal is offered at $60. per ton.

Castor Pomace. This is very much reduced in production, and priced more or less nominally at $35 per ton.

Fish Scrap. While movement is not too brisk, price is well above last month. Scrap is now $136 per ton and menhaden meal $140.

Superphosphate. Ample quantities are available and trade rather slow. It is priced at 88 cents to 91 cents per unit APA, per ton.

Potash. This trade is enjoying seasonal quiet with considerable of present production going to storage. No price changes indicated.

Germans Concerned With US Competition

Competition with the United States in world markets is reported to be of concern to West German producers of nitrate fertilizers. The West German firms must export extensively in order to utilize their capacity, and not too long ago, the U. S. was among their most important markets. China has recently become an important buyer of nitrate fertilizer, according to Ruhrstickstoff AG.

Between 1953–54 and 1955–56, it is reported that exports rose from 190,000 tons of pure nitrate to 293,000 tons.

War In The Congo

RECENTLY, the largest single shipment of weed-killer ever to leave Philadelphia was made and shipped to the Belgian Congo. This shipment of chemical was part of an appropriation of $2 million set up to combat the blue water hyacinth currently choking the waterways of the Congo River. The total shipment contained 80,000 gallons of material and is an indication as to the seriousness which the Belgian government hinges on the problem, in eradicating the fast spreading plants.

Solving the problem, perhaps it would be better if we looked at it first. To begin, the hyacinth grows at great speed and soon forms an impenetrable mat finally resulting in an impassable waterway too choked with vegetation to allow navigation.

Blue water hyacinth propagate by either of two methods: by breaking away from the parent plant and floating to another location and starting its own new "colony or clump," or it can accomplish its spread by sending out new off shoots from its original location. The end result has been estimated to produce over 800,000 plants per acre, and shows an expansion of 1000 times in 60 days. Water hyacinth was first noticed five or six years ago and then its potential danger was recognized in 1954.

The Congo is not alone in this problem, for the Southern United States has been ideal for growth of the plant. In the Gulf area alone, the plant costs navigation and agriculture an estimated 15 million dollars per year.

In combating the hyacinth, weedkiller will be sprayed along a thousand mile sweep of the Congo and its tributaries. The total area covered in this operation will be around 35,000 miles of bank along the river's course and around islands where the flowers impede landings and choke irrigation.

The Western World has an important stake in the outcome of this "War in The Congo." Sixty per cent of the world's uranium comes from the Belgian Congo, and is carried on the Congo River. This tropical highway is 3,000 miles long and is at points 20 miles in width. And it is this river which furnishes the only major means of getting the uranium ore out of the rich mines of the Belgian Congo interior.

Because of the seriousness of the situation in keeping the supply of ore flowing, the Belgian authorities declared chemical warfare on this flower of evil. ▲

Alphabetical List of Advertisers

editorial

THE possibilities of attaining a corn plant resistant to corn borers are becoming more and more of a probability every day. Thanks to the intensive research of Stanley D. Beck, who began his investigation on the problem several years ago at the University of Wisconsin, we have a fairly complete picture of the destructive habits of this worm.

Beck has determined some of the factors which govern the young larvae as they grow. And it seems that they cannot tolerate light and so try to avoid it by crawling and developing in the secluded darkness of the enclosed parts of the plant. An additional force which drives them to this area is a desire to be in a place where their bodies are in contact with more than one surface, in other words, to those areas where new leaves, ears and tassels are developing and are still folded.

In his investigation Beck also established that the young larvae have no particular preference as to the parts of the plant which they consume.

Further studies revealed that borers have an uncanny desire for sugar, and ate those parts which are particularly high in sugar. Their ability to detect differences in sugar content is only five per cent, while man's is 25 per cent.

When young, borers require a diet high in protein and low in sugar, but as they mature the diet requirement reverses and sugar is in more demand than is protein. Consequently at a young age the diet consists more of leaves than stalks and stems, which are the mainstay of the older larvae because of sugar content.

Beck, with this information on corn plant composition, is trying to develop a borer-resistant plant. A few years ago J. F. Stauffer discovered that certain corn plants had resistance to corn borers, because of an unknown substance. Beck, by isolating this borer resistant factor—he calls it Resistance Factor A—which is part of a large number of chemical factors, hopes to develop such a plant.

WITH a reported 45 plants capable of producing 4,236,000 tons of ammonia per year the problem of finding enough markets for the material has become a serious one. In an effort to help correct the situation, Allied Chemical's Nitrogen Division has announced a plan by which they hope to create new and non-agricultural markets.

The division, after devoting much time and money, stated they are pinpointing their efforts on a four part program designed to build up these new markets to absorb some of the surplus ammonia:

1. Fertilization of roadside turf along miles of state and federal highways, utilizing an application method similar to sandblasting. (see October FARM CHEMICALS, page 48).

2. Fertilization of woodland areas by means of aerial application. Fertilization boosts tree production by as much as 40–65 per cent.

3. Efforts to introduce fertilization of lakes and ponds to increase microscopic plant growth resulting in an increase of fish weight by 400 per cent.

4. Enriching the nation's pasture land which involves 620 million acres. By applying high analysis fertilizer, acreage will be able to support more animals and be ready for early pasturing.

The division, in experimenting with its Arcadian fertilizer, developed an ingenious method of feeding the fertilizer to the sandblasting nozzle. A pointed feeder, which pierces the bag, eliminates the necessity of opening the container and feeds the contents directly to the nozzle. By treating highways with fertilizer, a sharp reduction in erosion of embankments and damage by water run-off is realized. When considering the 41,000 miles of roadway which will be needing treatment, this phase of Allied's program looks encouraging.

The second area which is of importance in helping to reduce the ammonia surplus lies in forest fertilization. In considering this potential market, where over one third of the nation's 489 million acres of commercial forest land is below top productivity, Allied plans to reach the some 30,000 small pulpwood farmers. Additional areas under consideration hinge on the soil bank program. When in full operation about 7 million acres in trees may be required of the 25 million set aside for the conservation program.

Lake and pond fertilization are based upon the increased fish production which results from fertilization of under-water plants. Estimates indicate that the average pond requires from 800–1200 pounds of fertilizer per year. Not only does the fertilizer increase beneficial plant growth and increase the oxygen content, but also prevents the growth of water weeds.

Included in the campaign are efforts to enrich the nation's pasture land, which encompasses an area equal in size to four large states, or 620 million acres. By applying between 300 to 400 pounds of fertilizer per acre, the stock carrying capacity is increased and earlier pasturing is accomplished.

In entering this new phase of marketing of a surplus material it is encouraging to see efforts made to uncover new and lucrative areas where fertilizer can find application. As was quoted by Nitrogen Division men, "We are merely looking for every way to sell more nitrogen."

W. P. S., *Editor*

Buyers' Guide

Classified Index to Advertisers in 'Farm Chemicals'

ALDRIN
Ashcraft-Wilkinson Co., Atlanta, Ga.
Shell Chemical Co., Agr. Chem. Div., N.Y.C.

AMMONIA—Anhydrous and Liquor
Ashcraft-Wilkinson Co., Atlanta, Ga.
Commercial Solvents Corporation, New York City
Escambia Chem. Corp., Pensacola, Fla.
Grand River Chem. Div., Deere & Co., Tulsa, Okla.
Mississippi River Chem. Co., St. Louis, Mo.
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C.
Phillips Chemical Co., Bartlesville, Okla.
Sinclair Chemicals, Hammond, Ind.
Sohio Chemical Co., Lima, O.

AMMONIUM NITRATE
Ashcraft-Wilkinson Co., Atlanta, Ga.
Commercial Solvents Corporation, New York City
Escambia Chem. Corp., Pensacola, Fla.
Monsanto Chem. Co., St. Louis, Mo.
Mississippi River Chem. Co., St. Louis, Mo.
Phillips Chemical Co., Bartlesville, Okla.

AMMONIUM SULFATE
See Sulfate of Ammonia

AMMONIUM SULFATE NITRATE
Atkins, Kroll & Co., San Francisco, Calif.

BAGS—BURLAP
The Burlap Council, New York City
Chase Bag Co., Chicago, Ill.

BAGS—COTTON
Chase Bag Co., Chicago, Ill.

BAGS—Multiwall-Paper
Chase Bag Co., Chicago, Ill.
Hudson Pulp & Paper Corp., N.Y.C.
Kraft Bag Corporation, New York City
Union Bag—Camp Paper Corp., New York City

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
McIver & Son, Alex. M., Charleston, S. C.

BAG PRINTING MACHINES
Schmutz Mfg., Louisville, Ky.

BAG FILLING MACHINES
E. D. Coddington Mfg. Co., Milwaukee, Wisc.
Kraft Bag Corporation, New York City
Stedman Foundry and Machine Co., Aurora, Ind.
Union Bag—Camp Paper Corp., New York City

BHC AND LINDANE
Ashcraft-Wilkinson Co., Atlanta, Ga.
Pennsylvania Salt Mfg. Co., of Wash., Tacoma, Wash.

BIN LEVEL CONTROLS
Stephens-Adamson Mfg. Co., Aurora, Ill.
Blue Valley Equipt. Mfg. & Eng. Co., Topeka, Kans.

BIN DISCHARGERS
Stephens-Adamson Mfg. Co., Aurora, Ill.

BONE PRODUCTS
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

BORAX AND BORIC ACID
American Potash & Chemical Corp., Los Angeles, California
Woodward & Dickerson, Inc., Philadelphia, Pa.

BOX CAR LOADERS
Stephens-Adamson Mfg. Co., Aurora, Ill.

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Keim, Samuel D., Philadelphia, Pa.
McIver & Son., Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BULK TRANSPORTS
Baughman Mfg. Co., Jerseyville, Ill.
Highway Equipment Co., Cedar Rapids, Ia.

CALCIUM AMMONIUM NITRATE
Atkins, Kroll & Co., San Francisco, Calif.
McIver & Son, Alex. M., Charleston, S. C.

CALCIUM ARSENATE
American Agricultural Chemical Co., N. Y. C.

CALCIUM NITRATE
Atkins, Kroll & Co., San Francisco, Calif.

CAR PULLERS
Stephens-Adamson Mfg. Co., Aurora, Ill.

CARS AND CART
Stedman Foundry and Machine Co., Aurora, Ind.

CASTOR POMACE
Ashcraft-Wilkinson Co., Atlanta, Ga.
McIver & Son, Alex. M., Charleston, S. C.

CHEMISTS AND ASSAYERS
Shuey & Co., Inc., Savannah, Ga.

CHLOROBENZILATE
Geigy Agr. Chems. Div. Geigy Chem. Corp. N.Y.C.

CHLORDANE
Ashcraft-Wilkinson Co., Atlanta, Ga.

CLAY
Ashcraft-Wilkinson Co., Atlanta, Ga.

CONDITIONERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
H. J. Baker & Bro., New York City
Jackle, Frank R., New York City
Keim, Samuel D., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
National Lime & Stone Co., Finlay, Ohio
U. S. Graphite Co., Saginaw, Mich.

CONVEYORS
Baughman Mfg. Co., Jerseyville, Ill.
Blue Valley Equipt. Mfg. & Eng. Co., Topeka, Kans.
Joy Mfg. Co., Pittsburgh, Pa.
Link-Belt Co., Chicago, Ill.
Stedman Foundry and Machine Co., Aurora, Ind.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Sturtevant Mill Co., Boston, Mass.

COPPER SULFATE
Phelps-Dodge Refining Corp., New York City
Tennessee Corp., Atlanta, Ga.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

DDT
Ashcraft-Wilkinson Co., Atlanta, Ga.
Geigy Agr. Chems., Geigy Chem. Corp., N.Y.C.
Monsanto Chem. Co., St. Louis, Mo.

DIAZINON
Geigy Agr. Chems. Geigy Chem. Corp., N.Y.C.

DIELDRIN
Ashcraft-Wilkinson Co., Atlanta, Ga.
Shell Chem. Corp., Agr. Chem. Div., N.Y.C.

DILUENTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Pioneer Pyrophyllite Producers, Beverly Hills, Calif.

DITHIOCARBAMATES
Berkshire Chemicals, New York City

ELEVATORS
Blue Valley Equipt. Mfg. & Eng. Co., Topeka, Kans.
Link-Belt Co., Chicago, Ill.
Stedman Foundry and Machine Co., Aurora, Ind.
Stephens-Adamson Mfg. Co., Aurora, Ill.

ENDRIN
Shell Chem. Corp., Agr. Chem. Div., N.Y.C.

ENGINEERS—Chemical and Industrial
Blue Valley Equipt. Mfg. & Eng. Co., Topeka, Kans.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

FERTILIZER—Liquid
Clover Chemical Co., Pittsburgh, Pa.

FERTILIZER—MIXED
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Davison Chemical Co., div. of W. R. Grace & Co., Baltimore, Md.
International Min. & Chem. Corp., Chicago, Ill.

FILLERS
Bradley & Baker, N. Y. C.

Fish SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

FULLER'S EARTH
Ashcraft-Wilkinson Co., Atlanta, Ga.

FUNGICIDES
American Agricultural Chemical Co., N. Y. C.
Berkshire Chemicals, New York City
Tennessee Corp., Atlanta, Ga.

HERBICIDES
American Potash & Chemical Corp., Los Angeles, California
Monsanto Chem. Co., St. Louis, Mo.

HOPPERS & SPOUTS
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Berkshire Chemicals, New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

INSECTICIDES
American Agricultural Chemical Co., N. Y. C.
American Potash & Chemical Corp., Los Angeles, California
Ashcraft-Wilkinson Co., Atlanta, Ga.
Berkshire Chemicals, New York City
Fairfield Chem. Div., Food Mach. & Chem. Corp., New York City
Geigy Agr. Chems., Div. Geigy Chem. Corp., N.Y.C.
Pennsylvania Salt Mfg. Co., of Wash., Tacoma, Wash.
Shell Chem. Corp., Agr. Chem. Div., N.Y.C.

IRON CHELATES
Geigy Agr. Chems., Div. Geigy Chem. Corp., N.Y.C.
Tennessee Corp., Atlanta, Ga.

IRON SULFATE
Tennessee Corp., Atlanta, Ga.

LABORATORY SERVICES
Wisc. Alumni Research Foundation, Madison, Wisc.

LEAD ARSENATE
American Agricultural Chemical Co., N.Y.C.

LIMESTONE
American Agricultural Chemical Co., N.Y.C.
Ashcraft-Wilkinson Co., Atlanta, Ga.
National Lime & Stone Co., Finlay, Ohio

MACHINERY—Acid Making and Handling
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Acidulating
Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY—Grinding and Pulverizing
Blue Valley Equipt. Mfg. & Eng. Co., Topeka, Kans.
Bradley Pulverizer Co., Allentown, Pa.
Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ida.
Sturtevant Mill Co., Boston, Mass.

Buyers' Guide

MACHINERY—Material Handling

Blue Valley Equipt. Mfg. & Eng. Co., Topeka, Kans.
Clark Equipt. Co., Construction Mach. Div., Benton Harbor, Mich.
Hough, The Frank G. Co., Libertyville, Ill.
Joy Mfg. Co., Pittsburgh, Pa.
Link-Belt Co., Chicago, Ill.
Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora Ind.
Stephen-Adamson Mfg. Co., Aurora, Ill.
Sturtevant Mill Co., Boston, Mass.
Tractomotive Corp., Deerfield, Ill.

MACHINERY—Mixing and Blending

Blue Valley Equipt. Mfg. & Eng. Co., Topeka, Kans.
Munson Mill Mach. Co., Utica, N. Y.
Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Mixing, Screening and Bagging

Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Power Transmission

Link-Belt Co., Chicago, Ill.
Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY
Superphosphate Manufacturing

Link-Belt Co., Chicago, Ill.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MAGNESIUM SULFATE

Berkshire Chemicals, New York City

MANGANESE SULFATE

Tennessee Corp., Atlanta, Ga.

MANURE SALTS

Potash Co. of America, Washington, D. C.

METHOXYCHLOR

Geigy Agr. Chems., Div. Geigy Chem. Corp. N.Y.C.

MINOR ELEMENTS

Geigy Agr. Chems., Div. Geigy Chem. Corp., N.Y.C.
Tennessee Corporation, Atlanta, Ga.

MIXERS

Blue Valley Equipt. Mfg. & Eng. Co., Topeka, Kans.
Munson Mill Mach. Co., Utica, N. Y.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

NITRATE OF POTASH

Berkshire Chemicals, New York City

NITRATE OF SODA

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
McIver & Son, Alex. M., Charleston, S. C.
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C.
International Min. & Chem. Corp., Chicago, Ill.
Woodward & Dickerson, Inc., Philadelphia, Pa.

NITROGEN SOLUTIONS

Ashcraft-Wilkinson Co., Atlanta, Ga.
Commercial Solvents Corporation, New York City
Escambia Chem. Corp., Pensacola, Fla.
Lion Oil Company, El Dorado, Ark.
Mississippi River Chem. Co., St. Louis, Mo.
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C.
Phillips Chemical Co., Bartlesville, Okla.
Sinclair Chemicals, Hammond, Ind.
Sohio Chemical Co., Lima, O.

NITROGEN MATERIALS—Organic

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
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International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
McIver & Sons, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

NOZZLES—Spray

Monarch Mfg. Works, Philadelphia, Pa.
Spraying Systems Co., Bellwood, Ill.

PARATHION

Ashcraft-Wilkinson Co., Atlanta, Ga.
Monsanto Chem. Co., St. Louis, Mo.

PHOSPHATE ROCK

American Agricultural Chemical Co., N. Y. C.
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Ashcraft-Wilkinson Co., Atlanta, Ga.
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International Min. & Chem. Corp., Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

PHOSPHORIC ACID

American Agricultural Chemical Co., N. Y. C.

PLANT CONSTRUCTION—Fertilizer and Acid

Blue Valley Equipt. Mfg. & Eng. Co., Topeka, Kans.
Link-Belt Co., Chicago, Ill.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston Mass.

POTASH—Muriate

American Potash & Chemical Corp., Los Angeles, California
Ashcraft-Wilkinson Co., (Duval Potash) Atlanta, Ga.
Bradley & Baker, N. Y. C.
Duval Sulphur & Potash Co., Houston, Tex.
International Min. & Chem. Corp., Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
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Potash Co. of America, Washington, D. C.
Southwest Potash Corp., New York City
United States Potash Co., N. Y. C.

POTASH—Sulfate

American Potash & Chemical Corp., Los Angeles, California
International Min. & Chem. Corp., Chicago, Ill.
Potash Co. of America, Washington, D. C.

PRINTING PRESSES—Bag

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Clark Equipt. Co., Benton Harbor, Mich.
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SOILTEST EQUIPMENT

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SPRAYS

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SPREADERS, TRUCK

Baughman Manufacturing Co., Jerseyville, Ill.
Highway Equipment Co., Cedar Rapids, Ia.

STORAGE TANKS

Cole, R. D., Manufacturing Co., Newnan, Ga.

SULFATE OF AMMONIA

American Agricultural Chemcal Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C.
Phillips Chemical Co., Bartlesville, Okla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULFATE OF POTASH—MAGNESIA

International Min. & Chem. Corp., Chicago, Ill.

SULFUR

Ashcraft-Wilkinson Co., Atlanta, Ga.
Texas Gulf Sulphur Co., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULFUR—Dusting & Spraying

Ashcraft-Wilkinson Co., Atlanta, Ga.
U. S. Phosphoric Products Div., Tennessee Corp., Tampa, Fla.

SULFURIC ACID

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

SUPERPHOSPHATE

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
Davison Chemical Co., div. of W. R. Grace & Co., Baltimore, Md.
International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SUPERPHOSPHATE—Concentrated

Armour Fertilizer Works, Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

TALC

Ashcraft-Wilkinson Co., Atlanta, Ga.

TANKAGE

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Woodward & Dickerson, Inc., Philadelphia, Pa.

TANKS—NH3 and Liquid N

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TOXAPHENE

Ashcraft-Wilkinson Co., Atlanta, Ga.

TRUCKS—SPREADER

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Highway Equipment Co., Cedar Rapids, Ia.

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Atkins, Kroll & Co., San Francisco, Calif.
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Grand River Chem. Div., Deere & Co., Tulsa, Okla.
Nitrogen Div. Allied Chemical & Dye Corp., N.Y.C.
Sohio Chemical Co., Lima, O.

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Nitro-Form Agricultural Chemicals, Woonsocket, R. I.

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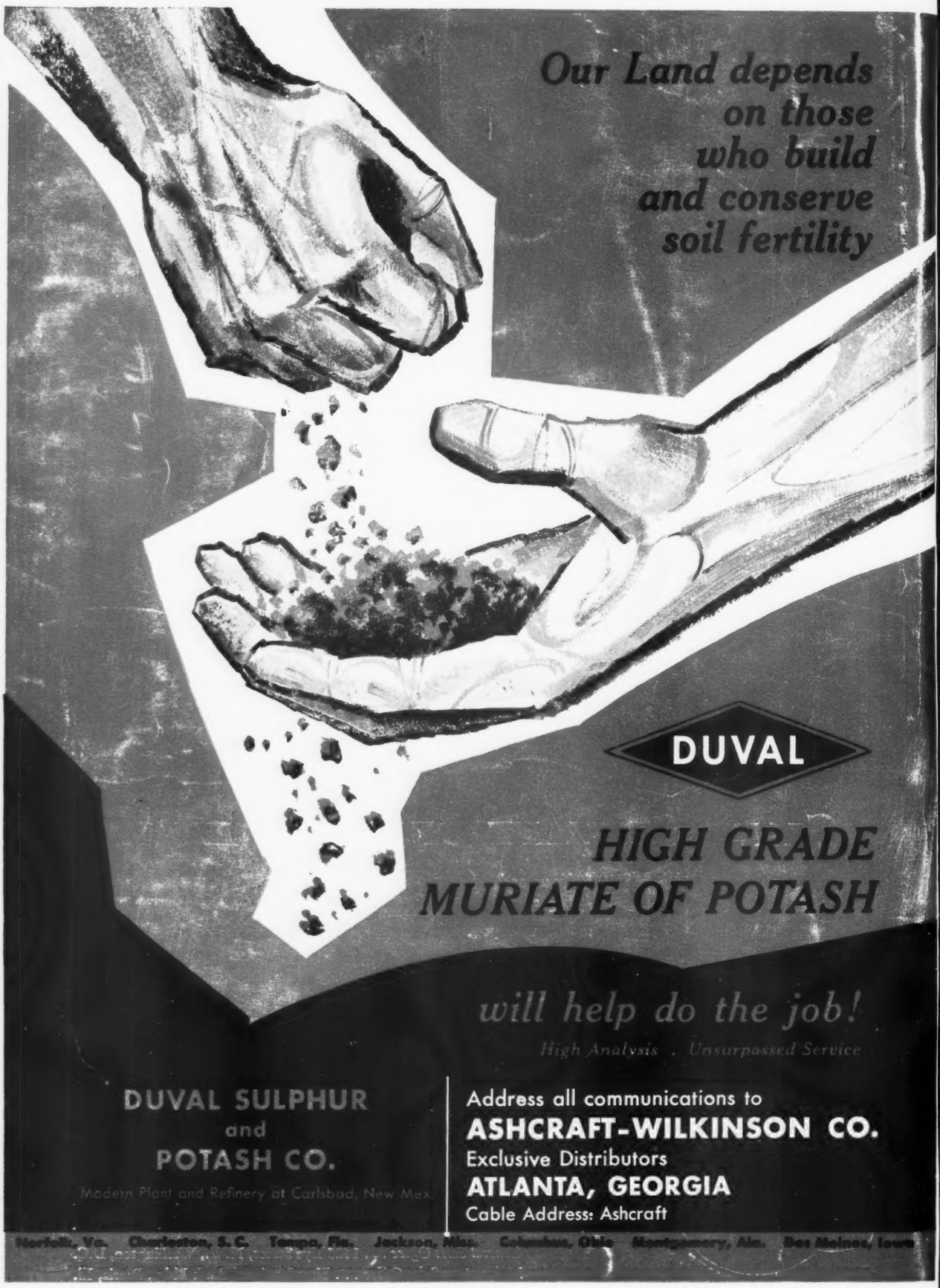
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